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THE FOUNDRY

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Trade Outlook.

The fact that many foundries are daily borrowing coke and iron from one another in order to keep their shops running, is but an indication of the activity the trade is experiencing. A shortage of cars in the Connellsville coke region, the chief fuel supply of the majority of foundries, is having its effect, not only on melters of pig iron, but also on the makers of the same. Isolated foundries, not in a position to receive temporary relief from others with a better coke supply than their own, have been compelled to go into involuntary idleness for short periods and several blast furnaces have been banked to await the time when the railroads shall be in a position to supply their wants with some show of regularity.

The transportation interests of this country are the greatest factors touching our manufacturing interests and as long as they are compelled to spend millions of dollars for new equipment to meet legitimate demands, there can be but little slackening of either production or consumption. Every branch of the foundry trade, brass, gray iron, malleable iron and steel, is a heavy contributor of its product to the railroads and no single interest exerts upon it as much influence. While complaints against the railroads on account of delayed deliveries are common it may not be out of place to remind the foundrymen that for a long time past they have not carried sufficient stocks to protect themselves against such belated shipments as might reasonably be expected to occur at one time or another. Doubtless the hope of lower quotations influenced them in adopting the hand to mouth policy they have been following, resulting in the inconveniences many have experienced through not guarding their base of supplies.

The year just closing has witnessed a longer period of high and uniform prices than was ever known. Improved machinery of all kinds has been purchased by the foundries on a large scale and in a general way it may be said that the year has been unusually prolific in new appliances affecting the foundry, to which the pages of this journal will bear witness. The prices of castings have advanced in conformity with the increased cost of material and labor though not nearly as far as circumstances would warrant. The cut-rate principle is strong among founders and no matter how good times we have, the melter of pig iron is always ready to try and get along with small and sometimes uncertain profits.

A Whirlwind.

The foundry receives a general overhauling occasionally, on paper, by persons who know a whole lot about it in a general way and nothing in particular. Under the name of "Old Contributor," one of these wise individuals stands sponsor for the following item in the Engineering and Mining Journal:

"One branch of the iron business remains where it was in the dark ages—the foundry. Several hundred years ago men learned how to break pig iron in half and throw them into a cupola, and how to alternate layers of coal or

coke and iron, to put on a wheezy blast, and to melt the iron and impregnate it with sulphur. They learned how to make iron castings with a tensile strength of 12,000 to 16,000 lbs. per square inch, when by a very slight change in the chemical constitution they may have double the strength. Foundrymen still follow in the footsteps of their predecessors and make castings from the cupola, with a maximum of labor, fuel and repairs, and a maximum of uncertainty in the product. I would like the chance to build a big foundry for the United States Steel Corporation. I should locate it on Lake Erie, close by the Lorain blast furnaces. There would be no cupola, but there would be a 200-ton Jones mixer with regenerative heating attachment, receiving melted low phosphorus pig iron in ladles from the blast furnace. The iron would be desiliconized in the mixture by means of iron ore. There would also be three or four smaller mixing vessels or ladles in which the iron, low in sulphur, phosphorus and silicon, could have added to it enough carbon, silicon, phosphorus or manganese, according to the result desired in the finished product. From these ladles the pouring ladles would be filled, and in them the metal would be allowed to cool down to the proper temperature before pouring.

"Thus there could be made castings of any desired quality and strength, and the results would be far more uniform than those obtained by the present method. For castings in which great weight, and not strength is desired, the metal could be poured into the molds directly from the blast furnace ladles without going through the mixing vessel and ladles. The foundry would contain several molding and pouring houses, with storage yards between, commanded by traveling cranes, like those in the beam yards at Homestead, and a mile or so of pattern storehouses. In these would be kept standard patterns for fly-wheels, gear-wheels, bed-plates, engine cylinders, roll-housings and the like, castings from which would be sold to any customer asking for them; also the private patterns of the great engine and machine builders. Such a foundry should be able to do the work of 50 to 100 of the small foundries scattered about the country, and it could sell castings to the Allis-Chalmers Co., the General Electric Co., and other big concerns cheaper than these works could make them.

"The great work of the iron trade in the past 25 years has been the wiping out of existence of hundreds of small blast furnaces, thus increasing the wealth of the world by saving labor, discharging men from poorly-paid, long-hour, arduous, manual labor, and pushing them into positions of shorter hours and higher wages. Shall not the next 25 years see a similar wiping out of hundreds of small foundries with their cupolas, which now encumber the ground?"

* * * * *

We would advise our contemporary to take its old contributor out on some vacant lot and perform the merciful mission of having him shot. He has evidently been dead for a great many years, but does not realize it. At least he gives every indication of having taken a long nap, for certainly the foundries of today bear but a small resemblance to those of fifty years ago, let alone the ones which existed during the dark ages.

His scheme for utilizing direct metal bears the earmarks of a highly over-educated donkey, but we will tell him of a chance to show its practicability. The manufacture of cast iron water pipe is a branch of the trade where his plans could be carried out, if at all. Large quantities of iron are consumed and can be disposed of in a relatively small space, and its physical qualities permit of reasonable variation. Let "Old Contributor" start right here and benefit every community in the land, and by that time he will be in better shape to take contracts from the Allis-Chalmers and General Electric people.

Some Live Questions.

With the National Founders' Association theoretical questions cut but little figure. Its members have to meet conditions as they are and no organization of foundrymen is better able to discuss the issues affecting the trade. For this reason the following questions, from the program for the fifth annual meeting of the Association, held in New York City, November 13th and 14th, are of general interest, and the majority of foundrymen will not want for an answer to some of these:

Are agreements of any character with core-makers desirable?

Is the molding machine for a complicated class of mahinery castings a profitable investment and should it be operated by molders or laborers?

Have contracts with individual employes proven of value?

Why is it that the National Founders' Asso-

ciation does not include every desirable membership in the country?

Is the National Founders' Association fulfilling its mission?

What policy should be pursued by the association when the molders in the employ of a member refuse to make what they call "struck work"?

Are any alliances between this association and any others organized for similar purposes desirable?

What are the advantages and disadvantages of the non-union foundry?

Is the New York Agreement fulfilling its mission or should it be in any way amended?

In what way should local associations be encouraged and how can they be made valuable assistants to the work done by the National Founders' Associations?

To what extent can molding machines be profitably operated by molders rather than by laborers or "handy men" in foundries doing agricultural, malleable or light gray iron castings?

Do strikes pay?

Are union men or their leaders fair?

Is the bench molder entitled to the same minimum, the same average or the same maximum as the floor molder?

Can malleable, light gray iron, or agricultural foundries be profitably conducted under union rules?

Are we ready for the universal adoption of shorter hours, and if not, are they desirable and how should the change be brought about?

Are the piecework or premium systems a profitable method of conducting a foundry doing machinery or jobbing work?

To what extent can "handy men" be profitably used in the foundry?

Are American foundrymen using every effort possible through apprentices and otherwise to increase the number of efficient molders?

Injunctions and their value.

The American Aluminum Association.

The manufacturers of aluminum in all forms, and others interested in this metal, have formed the above-named association with the following officers: President, Joseph A. Steinmetz of Janney, Steinmetz & Co., Philadelphia; vice-president, W. F. Pflueger of the Manitowoc Aluminum Novelty Co., Manitowoc, Wis.; second-vice president, W. H. Wagner of the Wagner Mfg. Co., Sidney, Ohio; secretary-treasurer, Palmer H. Langdon of *The Aluminum World*, New York.

It was the opinion of those present that if the aluminum business was to expand and become permanent it is absolutely necessary that every manufacturer should aim to turn out goods of the best quality and that no goods should be put on the market of a shoddy character. Much damage had been done to the aluminum business from a poor quality of goods and it was stated that not only should every one endeavor to keep goods up to the standard, but every one should continuously strive to improve the general finish and appearance of aluminum goods.

A manufacturer mentioned the difficulty his firm has had in making satisfactory aluminum hollow-ware. They were greatly bothered at first by the number of returned teakettles which they had to make good, and the losses were at first so great that it was a question with them whether or not they would continue the manufacture of aluminum teakettles. Finally, after a number of months of experimenting, they were able to make utensils which gave satisfaction and now their losses from returns are infinitesimal and they are as capable of turning out sound and satisfactory aluminum utensils, as they have been successful in making them of iron. A number of other subjects came up for general discussion, such as the action of salt on aluminum and the reasons for flaws in the metal.

A Cheap Supply.

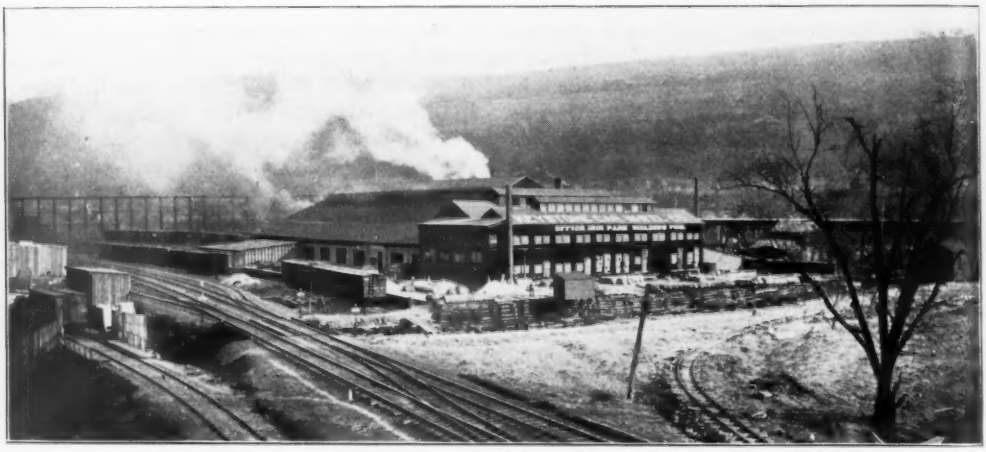
We recently inquired about the existence of a small brass foundry in a western state and received the answer that it was temporarily closed on account of the manager being arrested for stealing brass.

The American Foundry & Machine Co., now operating their plant at Glenville, Pa., will in the coming spring also take over the plant at Hanover, Pa., now known as the American Machine & Foundry Co. They will do a general foundry business at both places, paying particular attention to high grade machine tool castings, running the heavier work at Hanover and the light castings at Glenville. They expect to contract for considerable equipment early next year and would like to receive from manufacturers catalogues and other information which will aid them in selecting the most suitable appliances.

The Keystone Car Wheel Company's Plant.

The importance of the car wheel industry in the United States is probably realized by but few people even among those who view the enormous tonnage of freight being carried by the railroads. Were it not for the strength and durability of the car wheel and the care and skill of the wheel maker, to meet the requirements of the service and of the railroad officials, the wonderful freight traffic would be greatly curtailed, speeds slower, loads lighter and freight rates much higher than they are today.

After the chilled iron car wheel has outlived its usefulness in active service it still has the virtue of possessing a high value as scrap metal. It is the common experience that old car wheels usually bring very nearly the full price of charcoal pig iron, or say within one dollar per ton, so that practically the whole cost of a cast iron car wheel, so far as the railroads are concerned, is the cost of molding, melting and the maker's profit. It is thought that no other material will ever perform such a service at such a minimum of cost, although it is



PLANT OF THE KEYSTONE CAR WHEEL COMPANY, WEST HOMESTEAD, PA.

The built-up or steel-tired wheel is chiefly confined to use under cars in passenger service for the very simple reason that their cost is so very much greater than that of the cast iron or chilled wheel that no road in the world today feels justified in the greater expense involved in equipping freight cars with steel-tired or cast steel wheels. Hundreds of thousands of dollars have been expended in the effort to make a successful substitute for the cast iron wheel, but the latter has been much improved and is today fully meeting the requirements of the service to which it is subjected.

The advent of the Barber truck, which removes the tremendous leverage of the car and load from the flange of the wheel when striking a curve, has demonstrated that the only serious complaint of late years against the car wheel as now made was not justifiable, the truck now being able to perform its own duties satisfactorily.

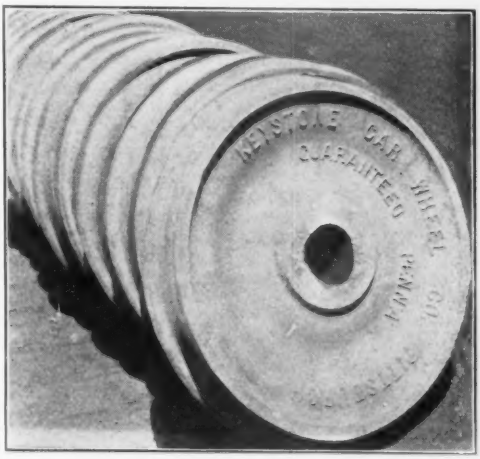
stated that millions are yet to be spent in the exploitation of steel wheels, notwithstanding the many elements of increased cost in this type of wheel, and its absolute worthlessness as scrap as compared to its first cost.

Added interest is attracted to car wheel making by the development of railroad equipment. Not only must the wheel stand a much greater mileage than was possible a few years ago, but the growth in size and capacity of freight cars without any corresponding increase in size and weight or improvement in design of the car wheel has necessitated the making of a much stronger wheel, capable of greater endurance and mileage, and it is stated that the car wheel manufacturers have accomplished all this with scarcely any additional cost to the consumer. The departure from the old twenty-ton car to the modern fifty-ton capacity car has been made within the past five years and the car wheel maker, more than

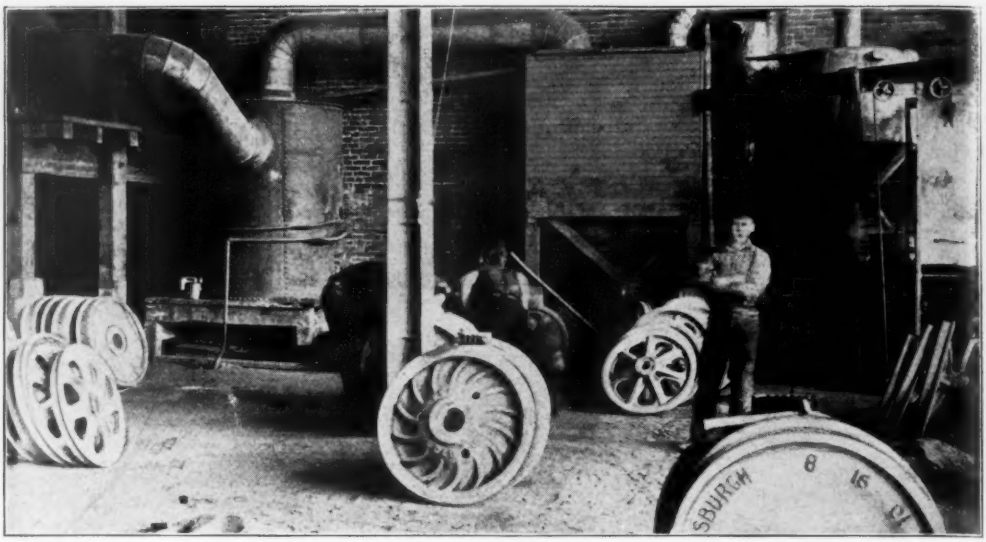
INTERIOR VIEW, KEYSTONE CAR WHEEL CO.'S FOUNDRY.

any other class of foundrymen has had a very large task to perform to meet the new conditions.

When an ordinary casting fails in service changes can be made in its design which would prevent the repetition, but not so with the car wheel, where limitations are prescribed in every direction to the sixty-fourth of an inch. As, for instance, the thickness through the flange cannot be materially increased without interfering with the frogs and switches; the hubs cannot be changed without interfering with the axle and truck standards and equipment, etc. The manufacturer of the car wheel has, therefore, been compelled to improve his product only through the physical qualities of the wheel itself. The records of the railroad companies show that the average manufacturer has been very successful in this respect, as indicated by the few failures of his wheels to perform the service required. Where failures have occurred the management of the roads cannot be said to be entirely blameless since they have shown inclination in some instances to go bargain hunting and buy the wheels at the lowest price, instead of the highest quality. Any practical foundryman knows that no one can afford to put into wheels a cold blast charcoal iron costing $28.00 or $30.00 per ton, where the finished product sells for $22.00, and because of the prevailing low price there is probably no product where there are such possibilities of wonderful results when the time arrives which will permit the railroads to buy or compel their purchasing agents to buy the equipment best suited for their service rather



GUARANTEED KEYSTONE CAR WHEELS FOR PENNSYLVANIA R. R. CO.



EXHAUST SYSTEM AND SAND BLAST APPARATUS USED FOR CLEANING CAR WHEELS.

than that which can be bought at the lowest price.

The Keystone Car Wheel Co. of Pittsburg, Pa., is a comparatively new concern among the car wheel makers, but its list of officers discloses the fact that its members are by no means amateurs in the car wheel business. C. V. Slocum is President; W. W. Lobdell, Vice-President; Louis B. Whitney, Treasurer, and W. L. Elkins, Secretary.

The Slocums were connected with a Buffalo wheel foundry for a number of years before starting their first venture in the Pittsburg district, viz., the Pennsylvania Car Wheel Co., which was acquired by the Pressed Steel Car Co., in 1899. The Keystone Car Wheel Co. was organized by Mr. C. V. Slocum in 1900. The Whitneys have been identified with one of the oldest car wheel plants in the country, The Whitney Car Wheel Co. of Philadelphia,

THE THERMAL TEST WHEELS READY TO RECEIVE THE MELTED IRON.

and one of the pioneers in the business. Mr. Lobdell hails from another noted family of wheel makers, the Lobdell family of Wilmington, Delaware, the oldest and probably the most favorably known car wheel company in the United States. If close application, long training and pluck develop talents favorable to success it would appear that the Keystone Car Wheel Co. should reach the goal.

The large plant which they built at West Homestead (Pittsburg suburb) a few months ago is already proving too small to accommodate the demand for Keystone wheels, and extensions have been made and others are in prospect.

As will be seen in the illustration, each molding floor is supplied with an individual air hoist, which performs whatever lifting is to be done during molding hours and in handling the iron on and for that particular floor at pouring off time. It is then utilized in shaking out the molds and transferring the newly cast wheel to the rear of the floor, where the wheel is loaded on a car and transferred to the annealing pits.

The whole system of making car wheels at this plant is arranged so that the product moves continuously in one direction. From the mixing ladle the metal is distributed to the different floors by the ladle cars, each ladle holding just enough iron for one wheel. These cars are operated by an electric cable system, four or more cars being attached and the space between each being so divided that it leaves the ladle at the center of each floor where it is

ELECTRICALLY-DRIVEN CABLE SYSTEM WITH LADLE CARS.

received by the air hoist. With this system one operator handles the entire distribution of metal and avoids the confusion and expense of hand buggies and a large force of men for the purpose.

From the molders' floor the red hot wheel is transferred by the air hoists to another cable system in the rear of the floors and which transfers the wheels to the annealing pits. From the latter the wheels are at the proper time taken by an air hoist to the cleaning floor, where they are run into a specially built cleaning machine and both sides of the wheel are cleaned at once. The exhaust system connected with the sand blast apparatus removes all the annoyances commonly experienced in the cleaning room of a foundry.

No branch of the foundry business requires such an extended system of tests as falls to the lot of the car wheel maker. At the works of

A CAR WHEEL MOLDERS' FLOOR.

INTERIOR VIEW, FOUNDRY OF KEYSTONE CAR WHEEL CO.

the Keystone Car Wheel Co. each tap from the cupola to the mixing ladle is tested before any portion of it is allowed to be poured into a mold. To the average foundryman it would probably seem impracticable to carry this practice into execution, but it is really accomplished with very little delay. The test sought at this early stage is to ascertain the chill or wearing quality of the iron and for this purpose a bar about two inches square by five inches is cast with one side resting on a chill. This cools very rapidly, and is assisted in doing so by being immersed in water, after which the test piece is broken. Should the depth of chill not be what is required, the iron is either poured into molds for castings other than car wheels or modified with special irons, when, if the proper result is not accomplished, the iron is poured into pig beds and later returned to the cupola and melted over again.

ON TOP OF ANNEALING PITS.

Test bars are poured at the same time with the test pieces to enable the exact strength of the iron to be obtained. A careful record is kept of the different molders' floors which receive each tap from the cupola, so that everything which may develop later in connection with the mixture can be traced directly to the portion of the heat from which it was taken.

The finished wheel passes through a continuous process of examination and inspection. Each wheel is carefully tested for hardness, for thin plates, thick or thin flanges, shrinkage cracks, or any other possible defect or objectionable feature. After the foundry inspection comes the testing by the railroad for whom the wheels are made. The Pennsylvania thermal test, so called from having been first adopted by this railroad, consists of surrounding the entire tread of the wheel with a band of molten iron one and one-half inches in thickness. This is considered one of the most severe tests, being far beyond any similar strain to which the wheel might be subjected in service from brake sliding or heating. The Keystone Car Wheel Co. make these tests daily for their own information concerning their entire product and in addition also furnish to the railroad company the number of wheels they require to test for each hundred wheels accepted. Similarly they also perform other experiments to determine the quality of the product in advance of the official inspection.

The drop test and chemical analysis form a part of the testing, so that it would seem almost impossible to go very far before discovering any deviation from accepted standards.

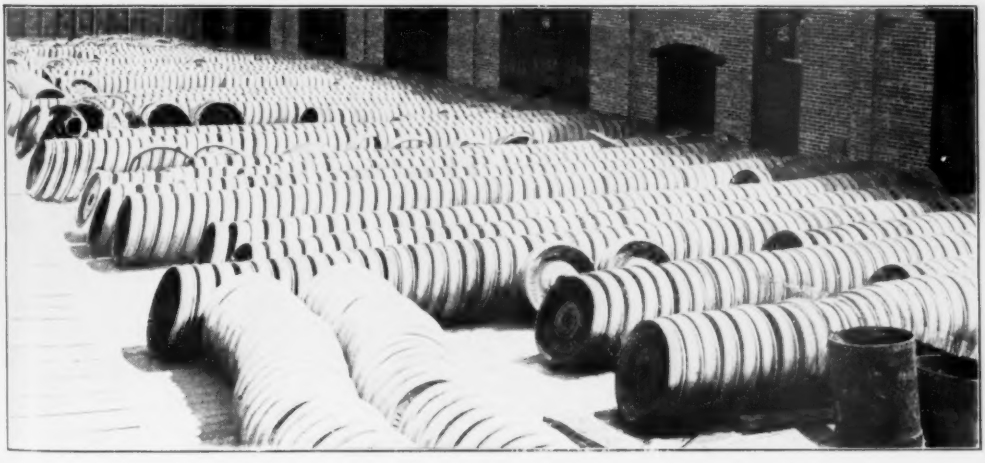
In view of all that is being said about coke

MOLDING CAR WHEELS.

iron being equal to charcoal iron, it is curious to note that all leading car wheel manufacturers cling tenaciously to charcoal iron, especially those who have a reputation for the good quality of their product. Some have even gone so far as to secure ore properties and to erect their own charcoal furnaces to guarantee them a supply of this iron uniform in quality.

The car wheel maker has at all times worked upon narrow margins of profit, and it would seem as though he would not burden himself with such financial expenditures unless the charcoal iron had proved in practice to be the best material for the wheels.

The Keystone works guarantee their mixtures, strength of product, mileage, etc., and easily stand in the front rank among the wheel



STOCK OF WHEELS CARRIED FOR PROMPT SHIPMENT OF ORDERS.

manufacturers, and, as will be seen by the illustrations, they also make car wheels for electric service as well as for mines, furnaces, steam railways, et cetera.

An Excellent Idea, if it Works.

An American journal, acknowledging that we occasionally receive excellent ideas from foreigners in the metal working lines, quotes as a good example of this a process of manufacturing iron columns proposed by a German named Rodolphe Rau. As an excuse for bringing this invention into the world, its originator says that it is well known that the size of cast iron columns is limited for the reason that if they are of more than a certain length, they are not sufficiently strong in consequence of the sagging of the core. Unequal strains are set up in the outside, and the moment of resistance is varied. Furthermore, cast iron columns offer but slight resistance to transverse blows or pressure. As a result, therefore, when heavy loads are to be carried, riveted steel columns are used. These columns are considerably more expensive than the cast iron columns because of their structure and the need of a separate decorative covering.

To overcome these difficulties and combining the advantages of a steel column with the architectural exterior of a cast iron column, the inventor proposes in casting the column to use instead of the core a steel tube, which remains in the finished column and gives it the requisite strength, while the cast iron covering may be fashioned to any architectural design so that special decoration is not necessary. In casting the column it is advised that the mold be placed somewhat obliquely, care being taken that the lower end of the tubular core is some centimeters above the floor.

The following additional directions are given, which we presume are necessary to success: "Into the mold is introduced the steel tube, which is to serve as a core. This tube is open at both ends, so that it is free for looking through it. Before the casting operation the core must be heated as much as possible, and for this purpose a current of superheated steam or hot air is admitted into the upper end of the tube. In this manner the mold can be heated to about 400 degrees centigrade. The column is then cast and the color of the steel tube is observed. After about two minutes it is cherry-red, and so soon as the color becomes brighter a current of saturated steam, or a mixture of saturated steam and air, is admitted. This becomes superheated in the tube and by absorbing heat serves to keep the tube at a constant temperature, not too high. For the purpose of such cooling a small nozzle, provided with a disk, is introduced into the upper opening of the tube. By this nozzle the saturated steam is admitted to the tube. If the nozzle is introduced into the tube so far that the disk closes the tube, only steam is admitted. If, however, the nozzle is somewhat withdrawn, the steam-jet will also suck in air, the purpose of which is to regulate the temperature of the steam. When the casting is solid, the cooling of the tube is interrupted and the whole is allowed to cool slowly.

"By keeping the color of the tubular core between cherry-red and yellow during the casting by means of steam or steam and air, two objects are attained—first, the tubular core cannot burn nor its molecular structure become altered, and, secondly, the cooling of the cast iron covering is not too irregular and the casting is not too brittle. In this manner there are obtained columns which in respect of compressional strength and resistance to transverse strains are considerably stronger than cast-iron columns."

We doubt if this resourceful inventor has ever undertaken to make a column of any great diameter along these lines. He will likely ere this have learned that the sagging of cores, of which he complains, will continue whether the steel tube he uses instead of a core is covered with loam or not. There are other difficulties in the way of carrying out Mr. Rau's ideas, and it is doubtful if this composite column will prove to be at all economical to manufacture.

The Wilmington Malleable Iron Co., Wilmington, Del., was transferred on October 31 to J. W. and Harris Wittemore, of Naugatuck, Conn., who have purchased the capital stock and will continue the business of manufacturing malleable iron castings under the name of the Wilmington Malleable Iron Co. The old company was incorporated in 1881 with a capital stock of $100,000. J. H. Baily was president and James Baily treasurer. The new owners will make numerous improvements in the plant, the wharf frontage on the Brandywine River is to be remodeled, new engines, tools and equipment will be installed and the plant brought to the modern standard in every department.

The Engineer in the Foundry: A New Departure.*

Since the advent of the American Foundrymen's Association in 1896, there has been a remarkable revival of interest in matters pertaining to the foundry. Prior to that time the best equipped foundry in the United States was that of the Walker Mfg. Co. of Cleveland, O., now operated by the Westinghouse Electric & Mfg. Co. of Pittsburg, Pa. Manufacturers from all parts of the country visited the southern shore of Lake Erie to get pointers in designing the new plants which have since been erected and now surpass in completeness the old-time model built by that almost forgotten inventor and pioneer foundryman, John Walker; but even in this celebrated foundry one could not, seven years ago, find an electric crane, compressed air hoist, blast pipe for cleaning molds from dust, sand blast for cleaning castings, pneumatic mold rammer, casting chipper or sand sifter, pyrometer for indicating the temperature of hot metal in ladles or vibrator molding machine for turning out small duplicate castings. These appliances, now so popular, had hardly been heard of when the call was issued in the spring of 1896 for the Philadelphia meeting of American foundrymen.

FIG. 1—FOUNDRY OF THE WALKER MANUFACTURING CO., CLEVELAND, O.,
As it appeared ten years ago. This plant is now operated by the Westinghouse Electric & Manufacturing Co.

The keen discussions which have taken place

*[At the Buffalo Convention of the American Foundrymen's Association, Mr. Samuel Groves, Foundry Engineer of the Westinghouse Machine Co., East Pittsburg, Pa., delivered a highly interesting lecture, illustrated with sketches and diagrams, showing the methods pursued in providing foundry appliances and equipment for that large institution, from which this article has been prepared.—ED.]

at the meetings of local and national societies, followed by the publication of technical papers in the high class trade journals, have evoked such intense interest that the once despised foundry is receiving almost more than

varying grades and thicknesses of castings, and this report was the direct result of the fierce controversy which had been going on for several years at meetings of foundrymen over the question whether pig iron should be

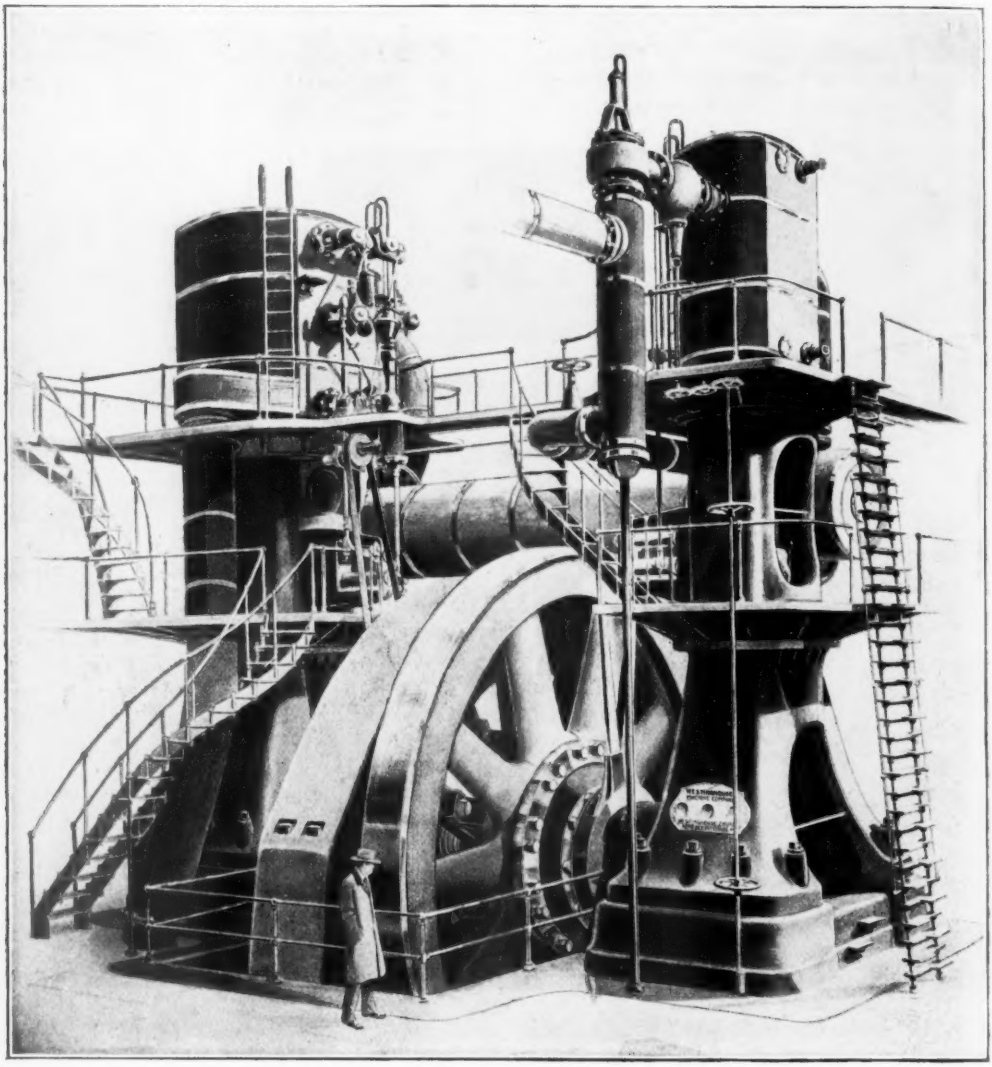


FIG. 2—EIGHT THOUSAND H. P. WESTINGHOUSE CORLISS ENGINE. CYLINDERS 46" AND 86" IN DIAMETER BY 60" STROKE.

its due share of attention. Nearly all the appliances mentioned as being absent from the so-called model foundry have been invented and placed on the market within the last five years. Perhaps the most important work ever achieved in the art of founding has been the Report Tests for metal mixtures suited to

selected by chemical analysis, or by fracture.

A new departure in modern foundry practice is the enlistment of the trained Mechanical Engineer into the practical everyday work of the large jobbing foundry. Within the last two years Mr. George Westinghouse has added to his world-wide fame by building one

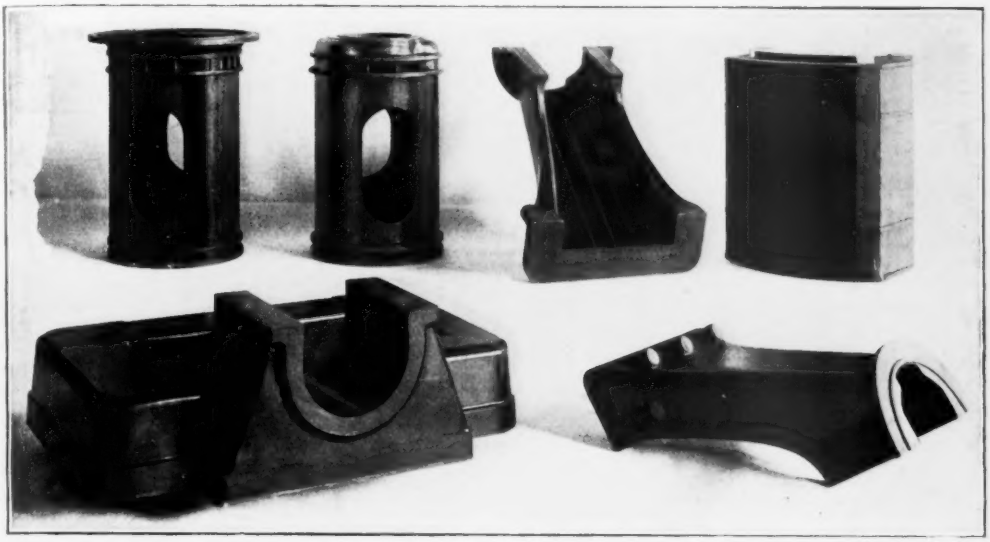


FIG. 3—MODELS OF CASTINGS REQUIRED FOR THE WESTINGHOUSE CORLISS ENGINE.

of the largest and best equipped engine building plants on the American continent, and is now making some of the largest stationary engines in the world. And since it has been my good fortune to have had a hand in laying out the heavy tools in these fine machine shops, in equipping the new foundry, and in designing the appliances in daily use therein, it may be of general interest to learn of some of the things being done in the foundries down at East Pittsburg. I may say at the very outset, however, that the "new departure" referred to, did not originate with the writer, but was conceived by the progressive and enterprising General Superintendent of the Westinghouse Machine Company, Mr. W. A. Bole, who not only takes a special interest in the foundry, but has an unusual knowledge of the minutiae and details of the best modern foundry practice; and, although not seen much at foundrymen's conventions, is doing good work in the cause of scientific founding by trying in the Westinghouse foundries every new invention and every new appliance which has behind it the promise of increased economy in the handling of material, or increased efficiency in the production of castings.

When the detail drawings of the 8,000-horsepower, vertical, cross-compound Corliss engines, 46″x86″x60″, were ready, the Superintendent called an evening conference of the foreman pattern maker, foundry foreman, and myself—as Foundry Engineer. On the table before us were one-inch scale models of the bedplate, housing, etc., as shown in Fig. 3, which had been wisely made to Mr. Bole's instructions, with a view of enabling us to conceive the form, and to discuss intelligently the best method of molding these large castings. Since the housing seemed to be the most difficult piece to make, the preliminary discussion was concentrated on this important casting, estimated to weigh about eleven tons. The possibility of molding in loam was first considered, and as ideas were advanced, I reduced these ideas to shape and form by a rough sketch on diagonally ruled paper, with colored pencils—red for brickwork; yellow for loam; and indigo-blue for ironwork. The various methods by which the mold could be bricked up in loam having been discussed and exhausted, the question of molding the housing in dry sand and an iron flask was then considered, the final agreement being that it should be molded horizontal, the joint of the flask to follow the contour of the underside of the pattern, which would act as a guide in bedding in the pattern and at the same time, make an admirable plan of parting drag and cope. With the aid of the rough sketches in colors, made during the progress of the discussion, the Superintendent was enabled to recapitulate the various arguments for and against the respective systems of molding, and then summing up the evidence, decided against loam, and in favor of dry sand and a complete iron flask. The case was now put to the engineer, who straightway de-

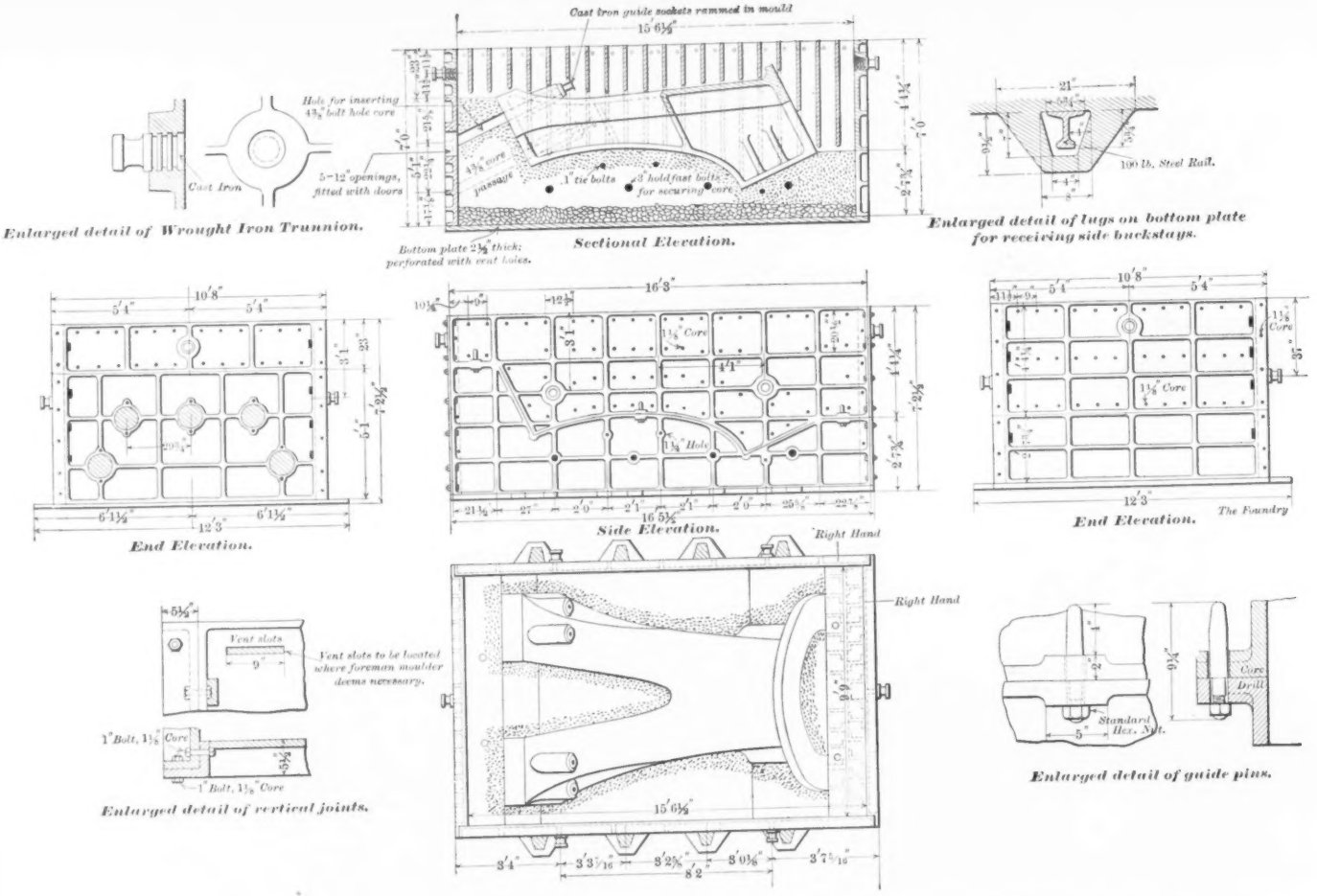


FIG. 4—DRAWINGS AND DETAILS OF FLASK USED IN MOLDING HOUSING CASTING FOR WESTINGHOUSE-CORLISS ENGINE.

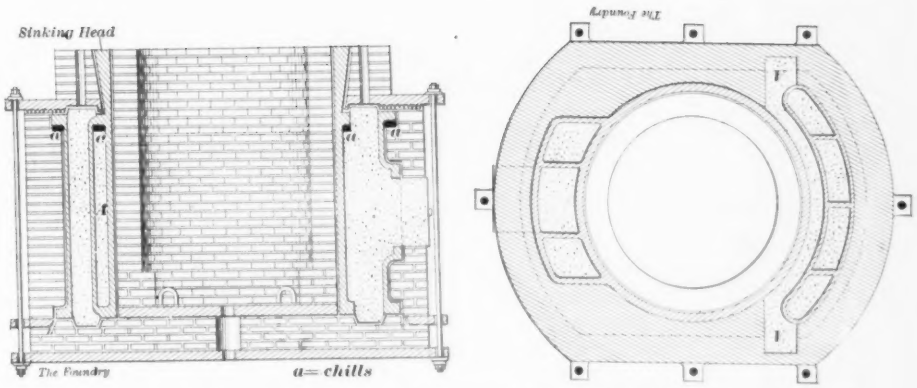
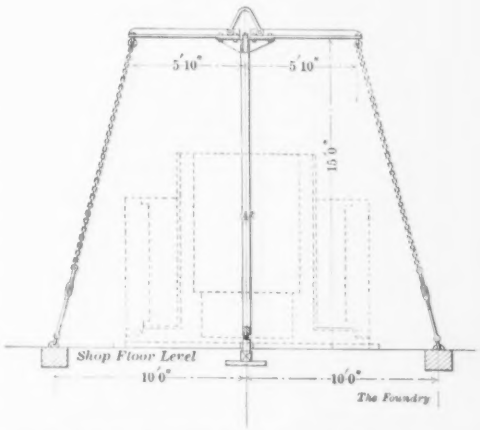
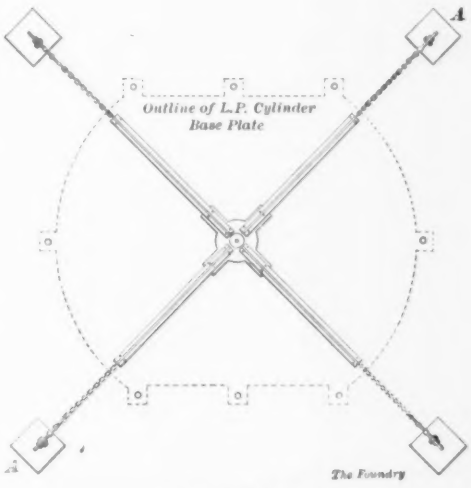


FIG. 5—SECTIONAL ELEVATION AND PLAN OF LOAM MOLD FOR HIGH PRESSURE CYLINDER.

signed the flask and its fittings on the lines agreed upon, as illustrated in Fig. 4. Without delay an official order was entered on the office books, just as an order would be entered for a Westinghouse Standard Engine, blue prints were sent out to the respective departments in the works, i.e., pattern shop; machine shop to have the steel trunnions and guide pins turned; blacksmith's shop to have binding tackle and lifting rig forged; and to the store room for the necessary bolts, thus relieving the foreman molder of the strain and anxiety necessarily involved in the getting up of a flask of such unusually large dimensions and complex construction; and, moreover, leaving him full time to look after his men and to watch the molds being made, and the castings being poured daily on the floor of the foundry under his care. Instead of the flask parts being made in the carpenter's shop, as is the common practice, they were made in the pattern shop; for the simple reason that a pattern maker is trained to read drawings; and with the aid of the complete woodworking machinery with which a modern pattern shop is equipped, the patterns were got into the foundry with expedition and despatch, and a manifest saving of time. Besides, in the making of the drawings by the engineer, every rib and bar and joint are carefully considered in the light of the stresses and strains to which the flask is likely to be subjected and the respective parts designed accordingly. Another feature of this system is the time saved by *anticipation*. The custom of today is for the foundry foreman to wait until the pattern is made, before taking steps to prepare the flask and its fittings. With the aid of an engineer having a practical knowledge of the art of founding, the flask can be made even before



SECTIONAL ELEVATION DIAGONALLY THROUGH A, A.



GENERAL PLAN.

FIG. 6—PORTABLE MOLD SWEEPING MACHINE.

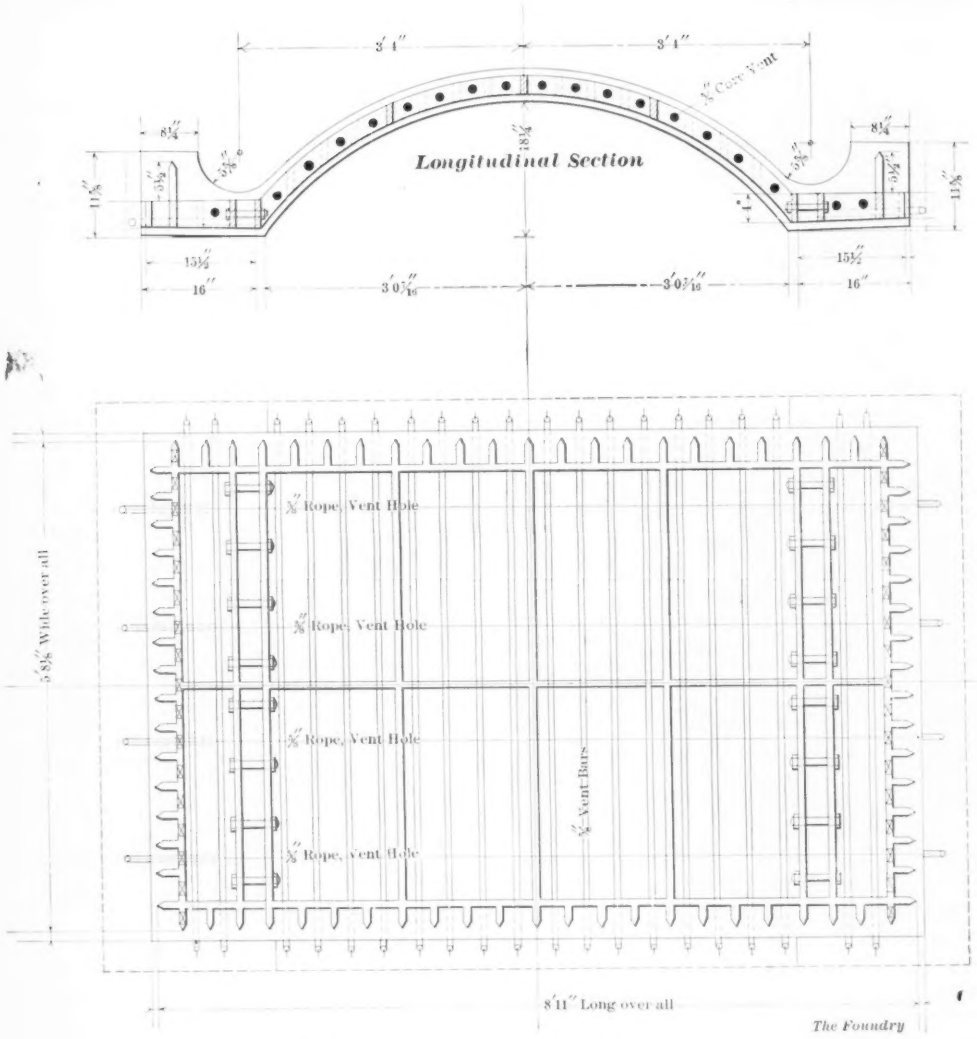


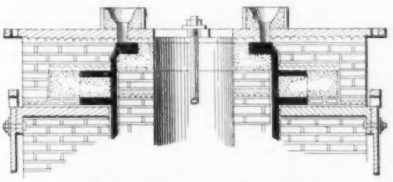
FIG. 7—GENERAL PLAN OF COMBINED CORE GRIDS, SHOWING METHOD OF VENTING.

the pattern is ready for use, for the making of the flask can be started as soon as the detailed drawings of the piece required are completed in the Drawing Office. One objection which may be urged against this anticipatory method is that very few foundry foremen of the old school can read a drawing well enough to be able to take into consideration all the conditions of form, partings, cores, etc., without a model or pattern, or core boxes. The reply to this is that the engineer should be skilled at picture making; that is, by the means of a quickly drawn series of views, say two elevations and a plan, and perhaps a cross section, round parts shaded, projecting parts shadowed, and the material—cast iron, wrought iron, sand, cores and the like represented by colored chalks, or pencils, an intelligent, modern foreman should be able to take in at a glance the precise shape and construction of the casting he has to make, and hence determine the most expeditious and economical method of molding the same.

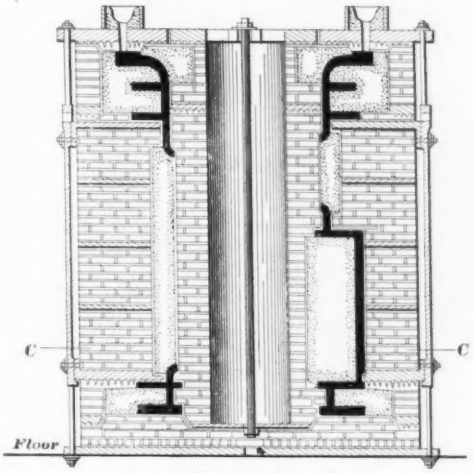
When it came to the making of the high and low pressure cylinders 46″ and 86″ diameter and weighing 12 and 21 tons, respectively, it was simply a case of "natural selection," for almost since the days of James Watt it has been considered the proper thing to mold large engine cylinders in loam. So a complete drawing was made, Fig. 5, showing arrangement of bricks, parting plates, cores,

etc., and further, the cross for lifting the sections of these loam molds, together with the lifting stirrups, binding rods, etc., which were carefully designed, and detail drawings sent into the shops. Even the binding and parting plates—usually made by rule of thumb—were drawn to scale, and prints sent into the pattern shops. The cross was calculated to carry a total load of 20 tons, with a safety of 10, so that as the work progressed, there was no anxiety about the safety of lifting tackle or binding rig, as all these mechanical appliances had been scientifically considered.

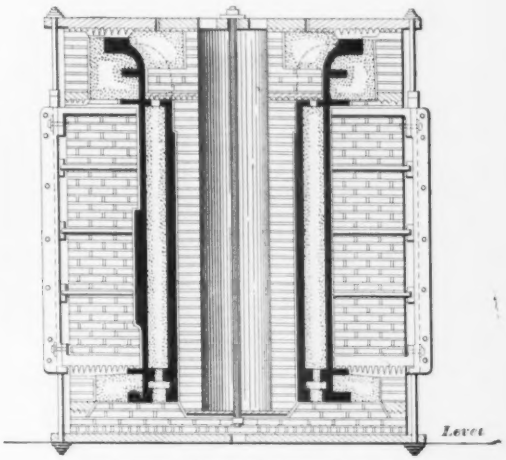
When the operation of sweeping the loam molds began it was found that considerable variation in the position of sweep spindle took place when the travelling crane passed that part of the shop wall to which the jib and footstep of the sweeping device was affixed; for the weight of the crane forced the wall out, and hence threw the spindle out of



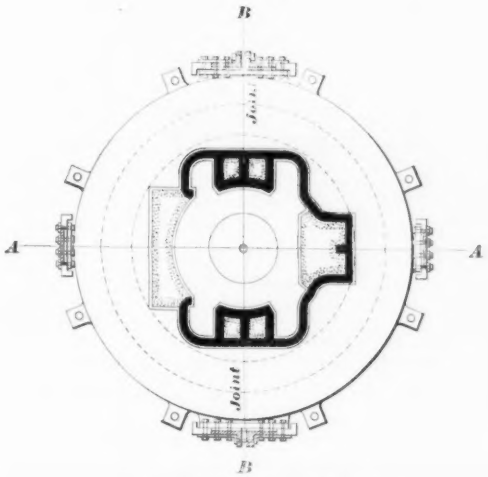
HIGH PRESSURE GUIDE



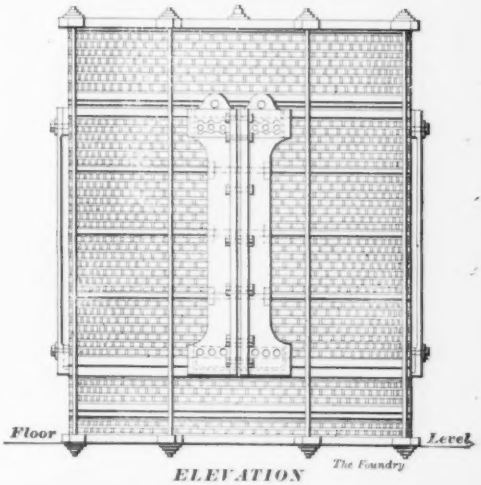
LOW PRESSURE GUIDE
Sectional Elevation through A-A



Sectional Elevation through B-B



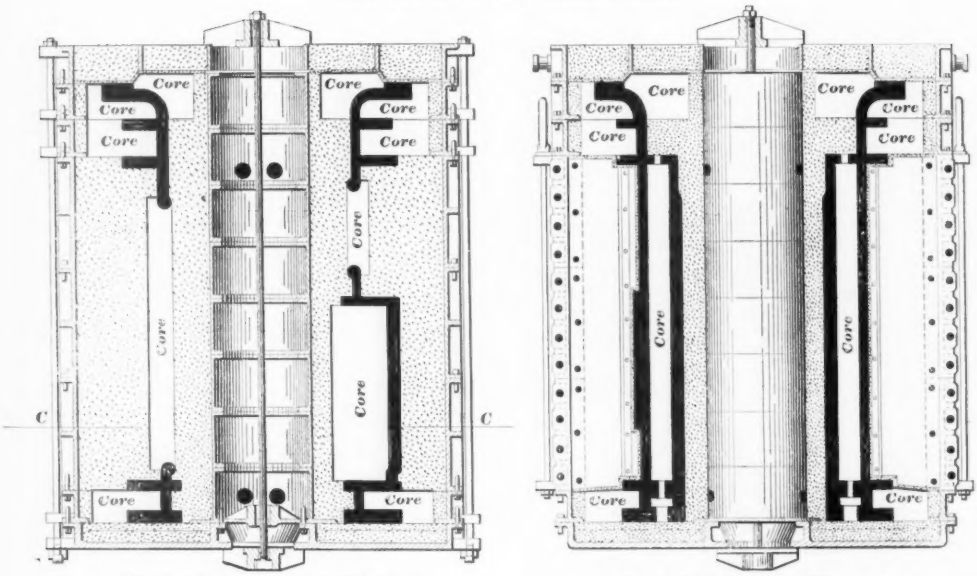
Sectional Plan through C-C



ELEVATION

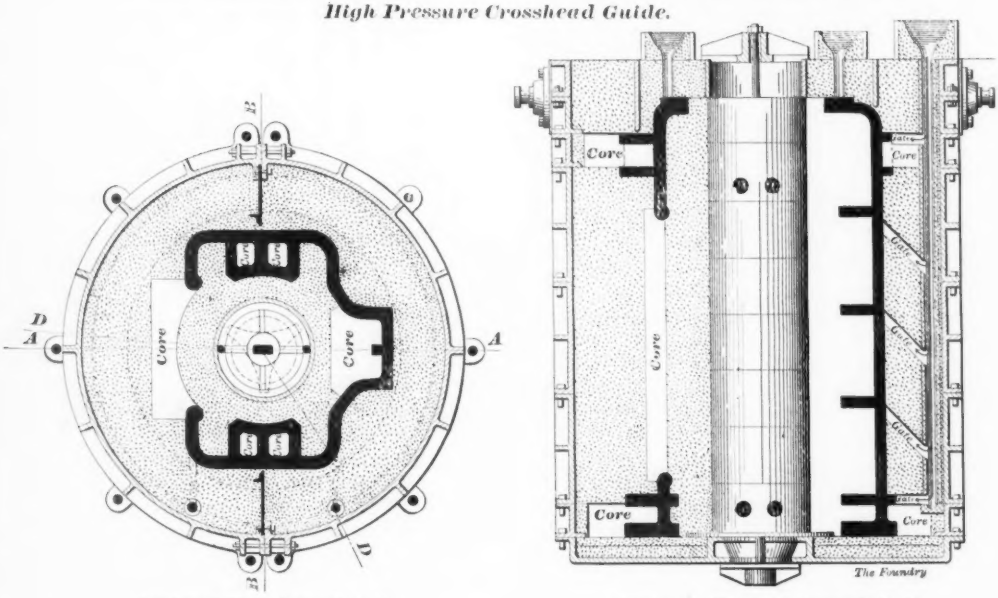
FIG. 8—DETAILS OF LOAM MOLDS FOR H. P. AND L. P. CROSSHEAD GUIDES.

Low Pressure Crosshead Guide.



Sectional Elevation through A-A *Sectional Elevation through B-B*

High Pressure Crosshead Guide.



Sectional Plan through C-C *Sectional Elevation through D-D*

FIG. 9—DETAILS OF FLASKS AND METHOD OF MOLDING CROSSHEAD GUIDES IN DRY SAND.

plumb by lifting the end of the jib. It was manifest, therefore, that if the cylinders were to be round, then all attachment to the flexible foundry wall would have to be abandoned and a radical change be made in the mechanical appliances for sweeping. In 24 hours we overcame this trouble, for I straightway designed a portable mold-sweeping appliance which could be operated independently of the shop wall, could be erected and adjusted in a few minutes in any part of the foundry; and could be just as easily removed when not in use. With this device, all our subsequent cylinder molds were swept successfully. One of the difficulties encountered in the preparation of these cylinder molds was the venting of the

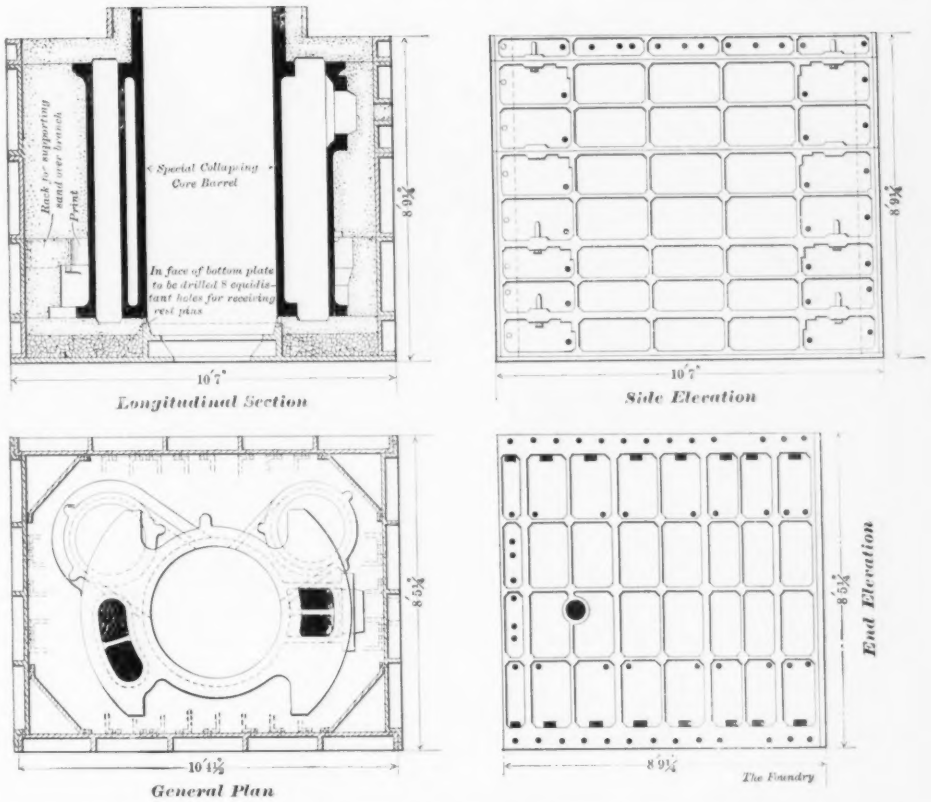


FIG. 10—DETAILS OF FLASKS AND METHODS ADOPTED FOR MOLDING LARGE CYLINDERS IN DRY SAND.

large radial core which separates the body from the port cavities—marked "A" on Fig. 5. These cores were made on machined base plates and in between the arbors the core makers inserted a series of ropes to form vents, see Fig 7. This scheme was a miserable failure, for, upon trying to withdraw the ropes, the hard rammed sand broke away, damaging the core beyond repair. With keen mechanical instinct Mr. Bole suggested a unique method of overcoming this difficulty; viz., to encase hard sash cord within rubber tubing. The East Pittsburg Foreman negatived the proposal and declared it would not work. The General Superintendent, however, held tenaciously to his theory, and the writer hunted through Pittsburg city for suitable rubber and rope, and found it. The core rope was 5-10" diameter, the rubber tubing, 5/8" diameter outside and 3/8" inside. They were both coated with plumbago and rammed in the cores. The tubing was not flattened by the pounding of the rammers, for the hard rope within prevented this. When the core was ready for putting into the oven, the rope was easily pulled out, when the tubing was withdrawn with equal ease, leaving a clean-faced hole 5/8" diameter and 9 feet long through which natural gas, blown in one end, could be

FIG. 10*d*—CROSSHEAD GUIDE CENTER CORE IN DRY SAND.

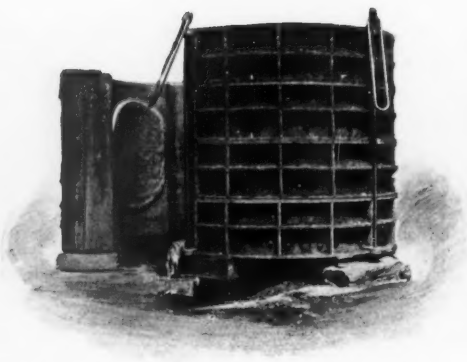


FIG. 10*b*—CROSSHEAD GUIDE MOLD IN HALVES.

lighted at the other, thus demonstrating a perfect vent. This original method of venting has proved a complete success.

Another notable feature in the making of these cylinders was the use of sinking heads 24 inches deep. The story of this experiment would make interesting reading, for there are few questions upon which there is a greater divergence of opinion among experienced molders than on the subject of sinking heads. Some day there will be an exhaustive discussion of this vexed theme; one other experiment, though, may be mentioned with unqualified approval, viz., the wise use of cast iron chills underneath the thick flanges of the cylinders, with a view of rendering the rate of cooling therein uniform with the lesser section of metal in the body. This device is by no means new, but it is one of the good things the old molder always has up his sleeve; and its application in this case was a gratifying success.

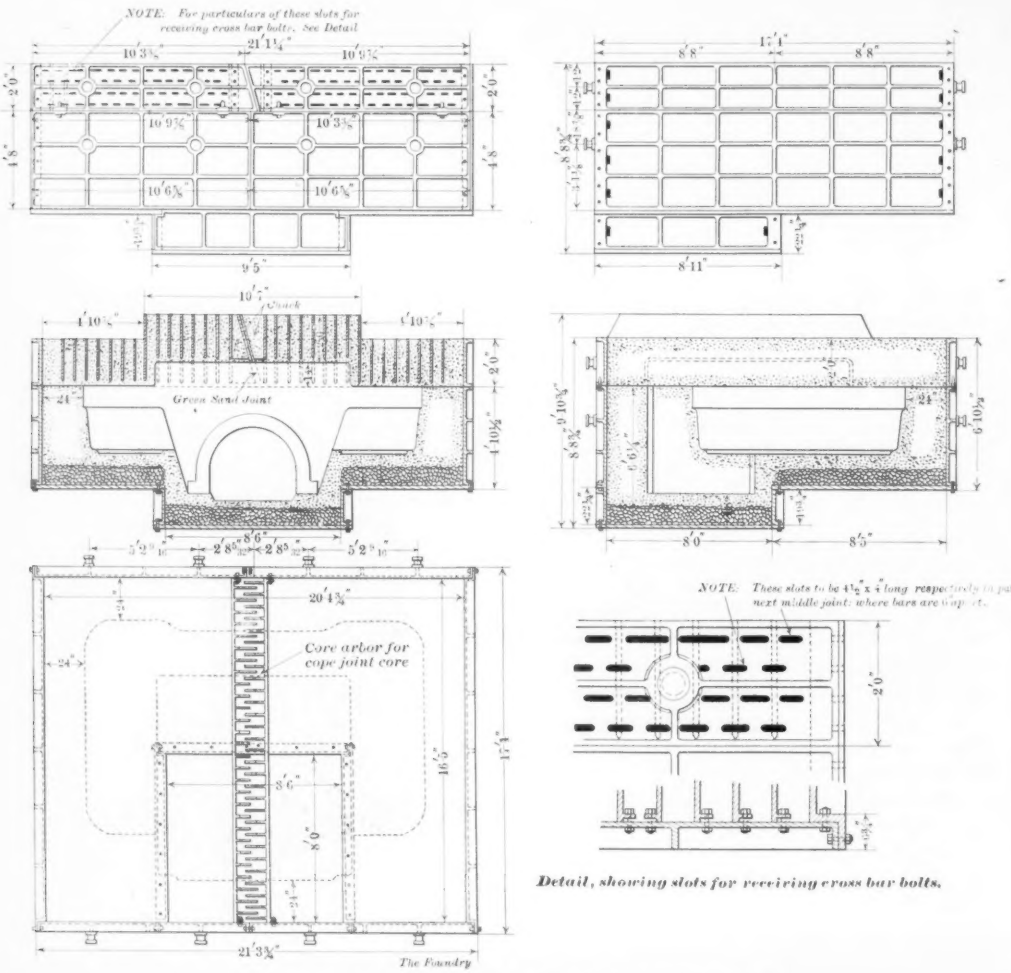


FIG. 11—ARRANGEMENT OF FLASK FOR MOLDING BEDPLATE.

Detail, showing slots for receiving cross bar bolts.

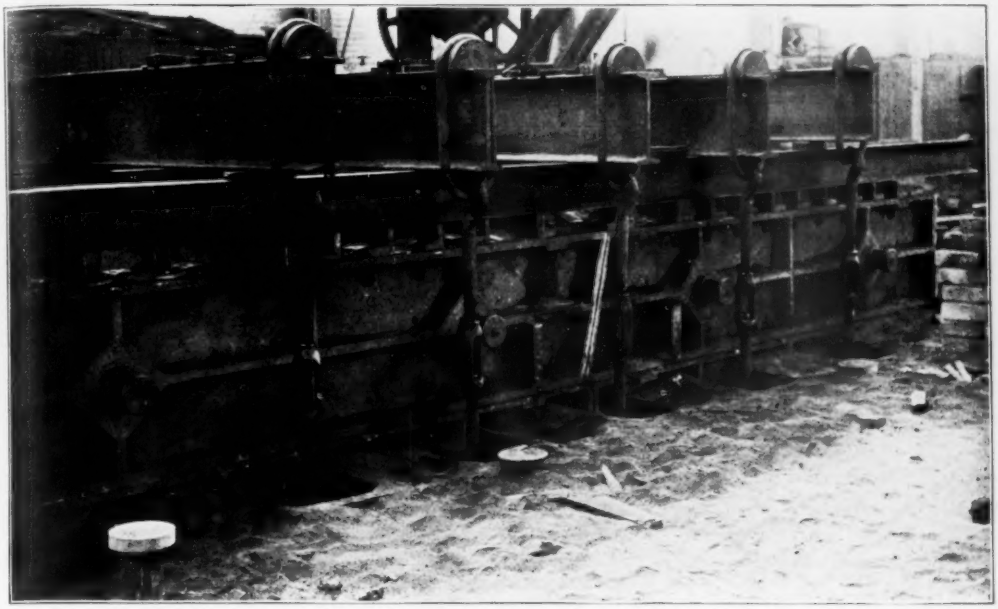


FIG. 12—BINDING RIG FOR BEDPLATE MOLD.

Perhaps the most complex and hazardous castings made in loam in this series of Engine parts, was the L. P. and H. P. crosshead Guides—weighing about 21½ and 19¾ tons each. From the diagram, Fig. 8, it will be seen that the lower and upper sections were made in complete rings, built upon 3-inch cast

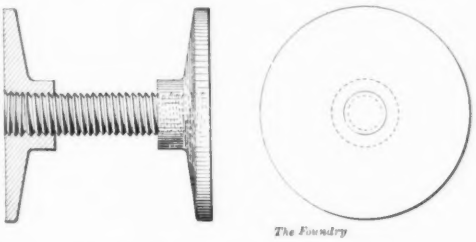


FIG 12*a*—BOLES ADJUSTABLE CHAPLET.

iron plates; while the main body between flanges, was made in halves; the whole necessitating two vertical and four horizontal joints. The mold was built up around a solid pattern, the dry-sand cores for the side openings being embedded in the brickwork; and while this operation was in process, the center core was being bricked up separately inside a skeleton pattern in another part of the foundry. The lifting of the complete rings was a comparatively easy matter; but the taking apart and hoisting of the middle halves was not quite so easy a task, since it involved the designing of a three-arm lifting beam in which the bending moments and center of gravity had to be accurately determined in

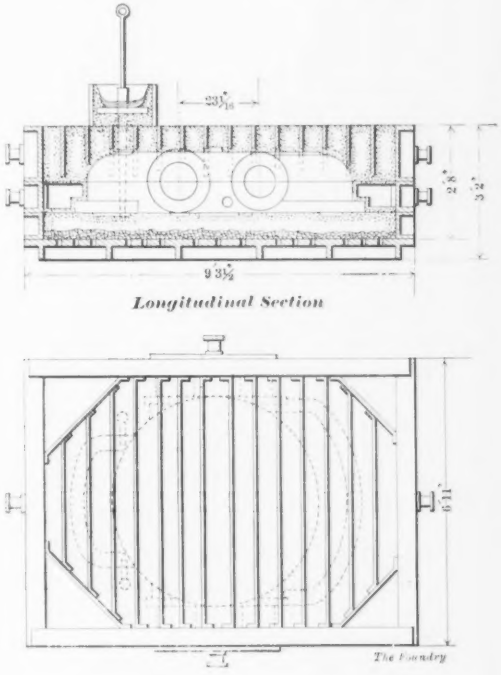


FIG. 13—METHOD OF MOLDING H. P. CYLINDER HEAD.

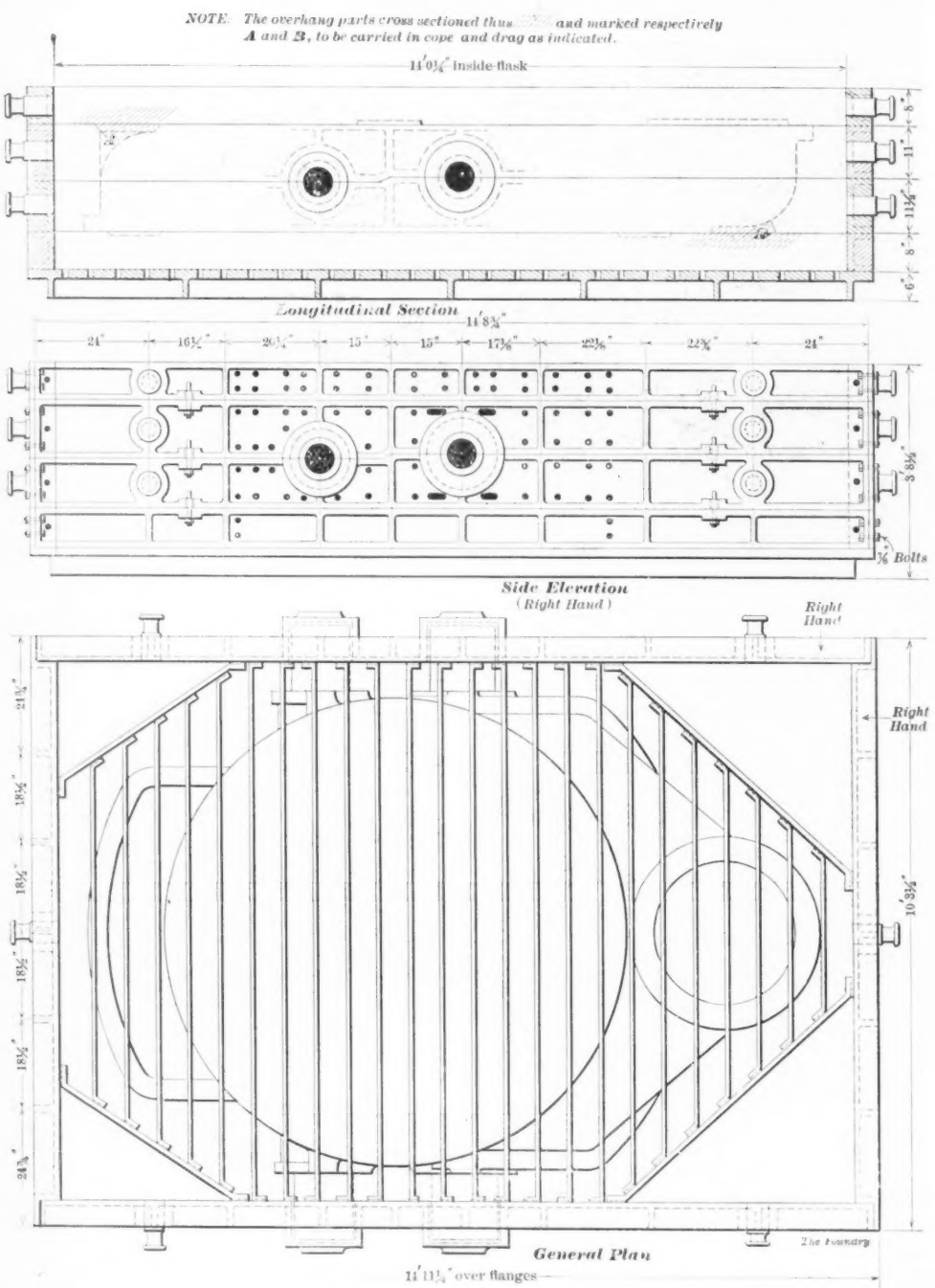


FIG. 14—FLASK FOR MOLDING L. P. CYLINDER HEAD.

order that the half flask would not tilt or strain, but lift perfectly level: a mechanical problem, the working out of which is altogether beyond the average foundry foreman.

I may be permitted to say that as regards smoothness of skin and evenness of parts, the cylinder and crosshead guides thus made in loam, have proved worthy of being classed with the best castings of magnitude produced by the modern founder. As the days rolled

on, however, the ancient objections to loam molding, i. e., the unsightliness of the loam molder's floor: heaps of broken bricks, daubs of mud plastered everywhere, and the difficulty of getting good loam molders, came into evidence again, as also did the question of time; hence, after giving loam molding a fair trial, a series of designs were drawn for the making of these cylinders and crosshead guide boxes in dry sand and iron flasks, as shown in Fig. 9.

The resort to this system of molding has been an unqualified success. It is true, the first cost of making circular cast iron flasks, and the necessary rigging for same is much more expensive than are the preparations and tackle necessary for molding in loam, but where a number of castings are required, and the time to get them out is limited, this difference is more than counterbalanced. We have proved the difference in time to be as 20 is to 30; and even as low as 13 is to 30, and a like economy has attended the making of cylinders in dry sand also.

Then to this astonishing economy in time is added economy of floor space, cleanliness of foundry, straining reduced to a minimum, and the producing of as fine, if not finer castings, the enthusiastic championship of dry sand over loam molding is not to be wondered at. Indeed, so convinced are those in authority down at East Pittsburg of the advantage and economy of dry sand molding over loam, where duplicate castings are required, that loam is a thing of the past.

The largest and heaviest casting of all the series was the bedplate, weighing some 43 tons, which was not bedded in the floor without a drag, but was made in a complete iron flask. See Fig. 11.

The drag was laid in a pit some six or seven feet deep, the foundation being made of 18 steel I beams, resting upon a pair of cast iron bearing bars, 6 inches square, through which at intervals were inserted 1¼ loops for securing strong holding-down bolts. The bottom of flask was made of ½-inch steel plates, resting on top of the I beams, upon which was spread a coke bed having 4-inch wrought iron vent pipes, protruding therefrom through sides of flask at intervals for conducting the generated gases to the atmosphere. The cope rammed with sand, being estimated to weigh over 60 tons, it was made in two parts, a tapered dry sand core forming the taking-up-piece. One advantage of this joint core was, that before closing in the mold, a molder with felt slippers and electric torch could peer into the mold and see that there was no crushing before the cope was finally bolted and weighted down. Fig. 12 illustrates admirably the unique building rig applied to this flask.

One feature in the construction of this mold was the number of large cores used, with consequent danger of shifting and unequal thickness of parts. That these castings have been produced with remarkable evenness of section is due to the use of the adjustable chaplet, in-

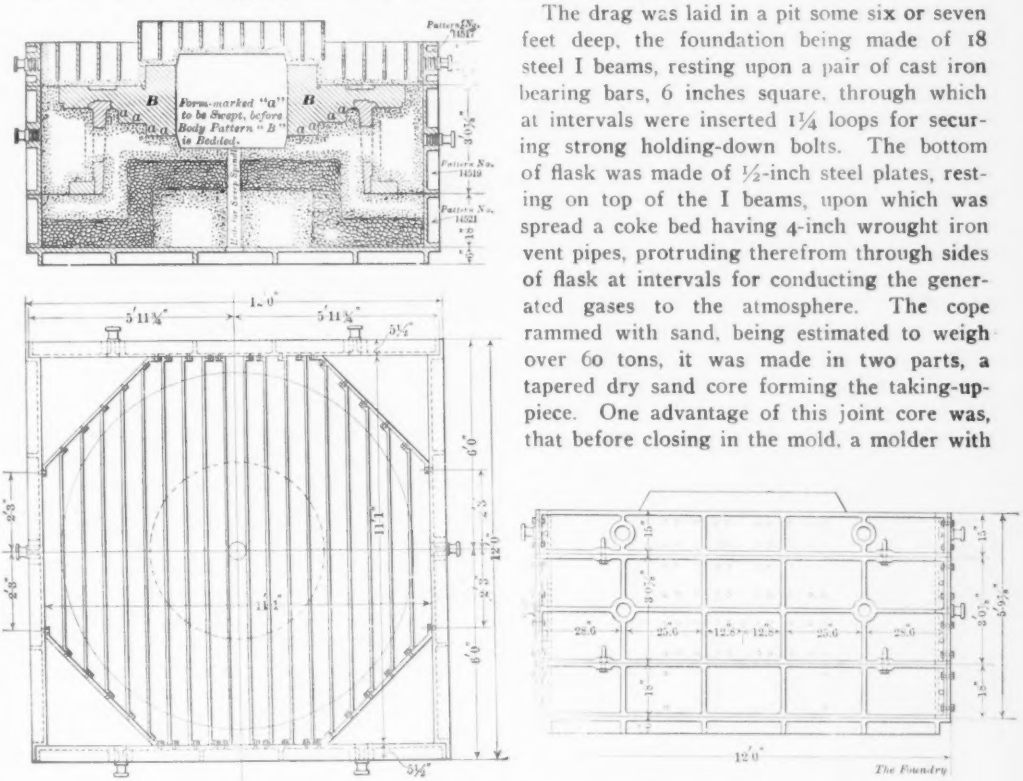


FIG. 15—FLASK FOR MOLDING FLY WHEEL CENTRES.

vented also by Mr. W. A. Bole. See Fig. 12 *a*.

In each bedplate mold about 100 of these chaplets were used. Figs. 13 and 14 show the four part flasks for H. P. and L. P. cylinder heads. Points worth noting are, the way in which the overhang in radial ends at top and bottom of L. P. are taken care of and a still better feature is, the manner in which the core prints for inlet and outlet branches in both the heads are carried through sides of flask without weakening the same.

The last illustration to which I will direct your attention is the three-part flask in which the flywheel centers were molded; and an admirable instance it is of the skill and resource needed on the part of the pattern maker, and the molder, in so constructing the pattern that the parts will draw with perfect ease, and so designing the mold that castings may be produced with economy and despatch.

We have thus passed before us in panoramic view the methods of molding the principal parts of an 8,000 H. P. vertical Corliss engine comprising bedplate, housing, crosshead guides, cylinders, cylinder heads and flywheel center. It is true, that in small foundries there is little scope for the foundry engineer, besides, small foundries could not afford to pay the salary such a man could command; but in large jobbing foundries where work of magnitude is done, there is doubtless great advantage, as I have shown, in retaining the services of an experienced engineer with a practical knowledge of iron founding.

The Holthoff Machinery Co., which has recently been organized at Milwaukee, Wis., with a capital of $600,000, will manufacture all kinds of mining machinery. The plant will be located at Cudahy, one of Milwaukee's manufacturing suburbs, and will consist of a machine shop 110 feet wide and 300 feet long; a boiler and sheet metal shop, 100 feet by 250 feet; a foundry, 100 feet by 250 feet; woodworking and pattern shop, 60 feet by 120 feet. The general offices will be located at the plant. The tools and equipment of the shops will be modern and strictly first-class in every respect, and especially designed for the manufacture of high-grade mining and metallurgical machinery. The moving spirits in the new company were formerly actively connected with the E. P. Allis Co. and are men of experience. The officers are: W. D. Gray, president; Henry C. Holthoff, vice-president and general manager, and B. T. Leuzarder, secretary and treasurer.

Some Experiences with Run-Outs.

In THE FOUNDRY for August Mr. Ramp has a short article deprecating mudding of joints or molds to prevent run-outs. It is good advice he gives when he says: "True joints, firmly tucked bars, and the sand firm behind the pouring gate." I have a religious respect for these teachings, because the neglect of observing them has caused us, one and all, many an uncomfortable quarter of an hour and long sessions on the stool of repentance; but the countless many, one might say the common herd, do not appear to profit by either theirs or others' experiences as they should. Day after day when casting time comes around they will yell at the top of their voices, "Run-out! Run-out!" and make frantic appeals for more iron. The funny part of it is that these occurrences, together with the general scramble and chaos that accompany them, are accepted by the majority as part, or the whole piece, of blamed hard luck.

Mr. Ramp's idea that if flasks are not fit to use, new ones should be built, and that patched up affairs are both dangerous and expensive, looks all right on paper, but I believe I am safe in saying that when Mr. Ramp makes this assertion he is not located in a jobbing foundry in the effete East. Here orders are received at the foundry under superheated steam pressure. Competition is so keen that luxuries like new flasks are seldom, if ever, seen. It is "Gobble up something," "Patch it up somehow," "Make a bluff at it," anything to appease Mr. Never Easy as he says: "This job must be cast today," or, if you will say we can't do it, he is going to send it over to "Make It While You Wait's Place." So there you are. You can't afford to turn this customer away, as he has considerable work. Of course, the molder who gets this job at once becomes heart-sick. He knows those old flasks with which he is supposed to turn out creditable castings, as he has been long familiar with them. However, this molder is selected because he can think and invent, and, with the help of carpenters, gaggers, wooden soldiers, good long spikes, the molder's best friend, good caulking or mudding, the piece is cast, cleaned and delivered.

This customer is, for the time, saved, and possibly he will have that very casting lying around his place a week before he touches it. But suppose the molder did lose this casting. The customer may grunt, but he will wait until a second experiment is made before

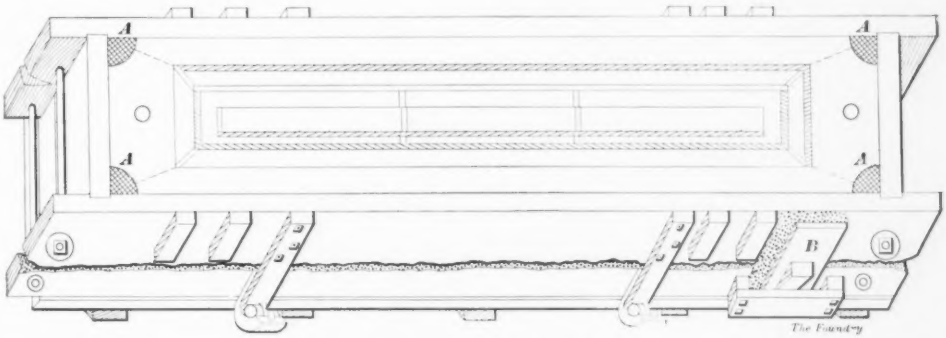
he will kick over the traces and take away his work to another shop.

My experience has been that of all ills to which the molder's calling is heir, run-outs are absolutely unnecessary, and it is certainly indisputable evidence of neglect or ignorance of the art of molding. To prove my statement, watch the next attempt of the same molder. He has the same pattern and now a much more impaired flask, yet there is no run-out on the second trial. What was hindthought before now becomes forethought.

When I first left my Alma Mater I had an experience which left an indelible impression on my mind. I took the crane floor in a foundry where machinists' tools, lathes, planers drills, etc., were the specialty. This company had the reputation of making very good work and a still greater renown for having the worst collection of flasks of any foundry for many miles around. In a few days I was introduced to an O. G. lathe pattern from which a number of castings were wanted. The flask, three-parted, when it was brought into the shop, struck terror to my heart and my courage left me altogether. Young as I then was in my experience, its old age and decrepitude should have commanded respect. It was so far gone that a man's hand could be placed almost anywhere between the joints. This was my maiden effort away from the paternal roof, and I was ambitious to not only please, but to excel all previous efforts at lathe bed molding in that shop.

The mold was made as shown in sketch and jointed where dotted lines are shown in the cheek, in order to roll sides and ends off. When opened, the bias joints were shaved and the sand cut away at the extreme ends, to allow of ramming in securely behind the shaved joints at AA. The shaving was done to allow the bolting together of the cheeks with ends in position. This was quite a deep bed, some 12 inches, and with the height of the cope would raise the head of pressure to 18 or 20 inches above the bottom or tracks of the casting.

I made a beautiful mold. It was a work of art when I got through finishing it. Every step taken in its construction worked fine. Some had been quicker, no doubt, but no mold better, and this was my first. Everything when closed up went together fine, and when ready for the iron I congratulated myself that for a starter I had done so well. We poured it, and everything was as quiet as the proverbial lamb. The foreman yelled "up," and some other fellow looking for trouble found it and shouted "Run-out!" Nearly stunned, I looked. There was the iron coming out, like water from a hydrant, from the further bottom corner and enlarging the opening every second. My ambition had a fall and I could see my finish right then and there, but a touch of kindness makes the whole world akin. The way that shop's crew each took their respective stations, sand shovellers, short pig iron handlers, water carriers, and a few with rammers pounding the sand in firmly about those pigs, while others with hand ladles poured iron into the further end of the casting, was something new to me. Fortunately, there was a surplus of iron in the crane ladle, and the foreman as calm as a clock kept watch on the metal gaining in the mold, while the volunteers were as busy as if killing snakes. "There you are, fill her up good and full," said the foreman, "to take the wrinkles out of it, and she'll be all right." I was rather nervous until I dug out between the bars in the cope and found that the casting had run up full at the most remote point from the gate. I turned



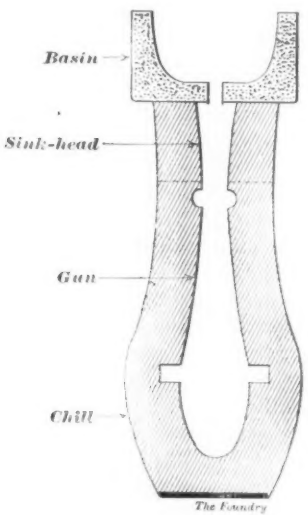
SOME EXPERIENCES WITH RUN-OUTS.

around to a shop-mate and remarked that it was a pretty bad run-out, to which he replied that he had seen the same casting run out at all four corners at once. I said that under the circumstances the casting must surely have been lost, to which he replied that such was not the case, and explained that the boys, having had so much experience with castings running out, had become so proficient that it would have to be a very bad run-out they could not stop.

I paid for all the boys wanted over at Dolan's after the bottom was dropped that night and thought I got off easy. That was the first and last run-out of a lathe bed with me, and I have made a great many afterward. Safeguards, as shown at B, are very good to secure the calking of a joint and prevent it bursting out. It is quickly and cheaply made and can be speedily removed and saved for the next time of need. This is not new perhaps, but it is very reliable. L. C. JEWETT.

Casting a Lyle Life-Saving Service Gun.

While superintendent of a Connecticut plant a couple of years ago, the writer had occasion to cast ten Lyle guns, the specifications of which required a tensile strength of 40,000 pounds, an ultimate extension of 20 per cent



CASTING A LYLE GUN.

and a specific gravity of 8.75. Previous to this time there had been some trouble meeting these requirements. This was principally due to the introduction of the tin when the temperature of the copper was raising, thereby producing an oxide which formed a parting in the structure of the metal.

Taking copper and banca tin in a proportion of 90 to 10 as weighed out by the government inspector from the same lot which had previously been used, we cast 10 guns successfully, with a tensile strength of 48,000 pounds and over.

As precautionary measures, I had the melter get the furnace good and hot and his crucibles well annealed and cleaned previous to beginning the operation. When everything was ready we charged the copper and melted it very hot, and this is where the heat is wanted, after which the copper was given a boil and instructions were given to let the temperature of the copper come down perceptibly, when the tin, which melts at a low degree, was added, and the whole stirred and mixed well with a skimmer. The metal was cast as cold as possible with the best of results.

We cast these guns in a two-part chill, split perpendicularly, as shown in sketch, with sink-head and runner as per illustration. We made the runner basin large enough to hold all the metal required for the casting. In the down-take of this runner we put a small piece of eight-sheet copper, perforated or filled with holes. This keeps the metal up until the basin is filled, bringing all the sullage to the top. By the time all the metal is in the basin, the perforated sheet is cut or burned out and the mold receives the metal. These guns showed a shrinkage of four inches or more in depth in the sink-head. E. C. WILLS.

Ten Days in a Steel Works and What I Saw There.

Early in the spring of the present year the crop of molders was very short in and around St. Louis, and one of the large steel foundries on the Illinois side of the river was forced to draw on the cities of Cincinnati, Hamilton, Dayton and Indianapolis in the East, and on Kansas City, Omaha and Joplin in the West, and for this purpose two agents were sent, one in each direction, and as business was slack in most of the above named cities at the time, it appears that the agents had no trouble in securing men, judging from the number that were shipped. Some good men were among them, but many misrepresented themselves to the agents without a doubt.

All that came were put to work, however, and received the regulation wages of $3 per day. There is no doubt that some of them obtained this under false pretense, which was

an imposition on the company, to be sure, but they were all union men and it was compulsory on the part of the company to pay the scale.

Three molders and two helpers worked together on each floor, and each floor had a set day's work and with three fairly good molders and helpers of the same quality, a day's work could be put up by working faithfully and steadily.

The foremen used little judgment, however, and the men were, according to custom, placed indiscriminately. The result was, that at times the actions and happenings on some floors were amusing, and again disgusting. Bench and stove molders in this shop are called ding-a-lings, and on the floor next to me three new men were started with two green helpers. One of the molders was a good man, his actions proved it, and after the first flask was lifted off his two partners started finishing the cope. One had a set of "snapper's" tools, the other held his double ender in his mouth while using both hands to draw a lug, showing conclusively that he was a stove molder. At the end of the day with only a half day's work up the machinery molder said he was up against it and quit. Next morning an old head who had been off for a few days came in, and was put with the ding-a-lings, but after the first flask was rammed up, he said he wasn't feeling very well, grabbed his coat and went out; his partners finished that flask by noon, and got the cope lifted off the second one by quitting time, six flasks being a day's work. Next morning the two ding-a-lings didn't shine, each having laid off trying to get rid of the other.

Joe Shaw came with a delegation from the West and from his own conversation one could tell he was tickled to death with his job in the steel works, because he stayed there all of two weeks, when he got homesick and wanted to be back where the Kansas wind could zip through his mustache. Joe is a close student of metals and came here in the interest of science more than anything else, and it was understood that on his way home he was to give a series of lectures on steel founding to the molders of Joplin, Webb City, Carthage and Fort Scott.

The traveling cranes and other equipment of the same nature in the shop were the finest that money could buy, but the shop tools were scarce, and the poorest imaginable, barring gaggers and sand. It was nothing unusual to see a molder brushing off a joint with a piece of a bag, while the helper on the next floor would have a brush hid under the follow board of the drag that was being rammed up, or else in the bosom of his shirt, while another helper at the other end of the shop would be down on all fours looking for one under the flasks, giving him the appearance of sliding along on his ear. New riddles were distributed frequently, but the only kind that could be found were the ones with a side about as wide as a hoop on a flour barrel. Tool boxes were something unknown and each molder carried them, lifters and all, in his pistol pocket, and didn't dare lay them down any more than he would a dollar, for fear they would get lost. Parting sand was brought in nail kegs, and about the first time one would go down after both hands full he would tear a sleeve off his shirt, or tear a gash in his arm, and about the second time one would want to use it he would see a helper from the other end of the shop running away with the keg and all. Upon the molder starting one of his helpers after him, they clinch, wrestle, spill the sand, and helper comes back with the empty keg.

Gaggers, or an old burnt core rod that would bend with every blow were the favorite rapping bars, because the "industrious" helpers used to keep the good ones hidden. The oldest inhabitant never remembered seeing a swab pot in the shop, and a bucket was a curiosity; if any were there they must have been kept in the office safe, in most cases the piece of bag that served as a brush was pressed into service as a swab by dipping it into the tank and splashing it on. All the flasks had been "good old wagons," but most of them had "done broke down," and an ordinary sized dog could jump through the joint of an empty one.

"Senator" Winn came in one consignment from Cincinnati, and it was said by some that he signed articles to remain a certain length of time, some say one year, others two, anyhow the Senator is there yet, says he likes it, and wouldn't quit there to take the best job in Frazer & Chalmers. He is just as eloquent as ever and wears tan shoes.

In this shop the molders and helpers were partly responsible for the conditions that surrounded them in regard to shop tools, because when the shop opened less than a year before, the supply and facilities were all that could be desired; each floor had three shovels, three rammers, one rapping bar, one clamping bar,

three vent wires, one heavy hammer, one light one to nail bars in with, one bucket and a swab, including a large sized closet to keep them in over night, also for the molders to keep their own tools in instead of having to carry them home at night, as must necessarily be done now. The light hammers were the first to disappear, as they were just the right size to be handy around the house, and a little later when a night turn was started, that did settle it; whenever a night man couldn't find something he wanted right away, he would invariably pick up a clamping bar, use it for a jimmy, break open a closet door, and if he didn't find it there he would go down the line breaking them open until he did find what he wanted. Molders' tools began to disappear about this time, and the night men would hide some of the shop tools, so that they would know where to lay their hand on them the next night; the day men couldn't find those of course, and would hide what few they had on the night gang, so that they would know where to find them next morning. Sometimes the crew of one shift would find what the others had hidden, and would hide it in another place. This was aggravating at times, but it seems there was no remedy, and apparently no effort was made to effect one. There being about two hundred molders employed on both shifts this number will give one an idea of the confusion that prevailed most of the time.

C. RITIC.

The Krank's Korner.

I have read a paper on "Machine Cast Foundry Pig Iron," written by Albert Ladd Colby, and find a certain amount of consolation for the foundry therein.

We have been told on sundry occasions that if foundries would drop rule-of-thumb practice, whatever that means, they would be happy and make more money. Mr. Ladd says that "furnaces sometimes smelt and reduce the ore irregularly" and I think that before undue attention is paid to the foundry it may not be out of place to suggest that the blast furnace be set to work in a regular way.

Mr. Ladd's contention that there can be no excuse for having dirty iron when sandless pig iron is used is rather ambiguous. Sand-cast pig iron, when properly melted, has for a great many years given a tolerably clean iron, and the only people we know who have complained of dirty iron are the ones who have tried to melt fifteen pounds of iron with a pound of coke. At any rate Mr. Ladd's argument along this line is far-fetched, because in running a foundry, even if he has a sandless pig iron, he will yet be obliged to use a sand-cast scrap iron, of which he will make more or less, according to his ability as a scrapmaker.

That the foundryman should buy the iron suited for his work is something not to be denied, and in fact I believe that he has been trying to do this very thing, and has had the assistance of the furnaceman in this respect for many years. A good many sermons have been preached to show that if a foundryman would run his shop according to chemical analysis he will have a uniform product. Now, why not let the chemist begin further back and prescribe such a mixture of ores as will enable the furnace to produce a pig iron of uniform composition?

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Someone has discovered that the father of the late William McKinley at one time was foreman of a Niles, Ohio, foundry.

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The practice of permitting molders to leave the shop as soon as they have their floors poured off is probably responsible for the general aversion which the craft shows towards automatic time recorders. In some instances the introduction of time clocks has been followed by the notice that the molders must remain at the works until the regular quitting time. As a general rule, it may be said that at best but little can be done after the heat is poured and furthermore that the physical condition of the employes demands a rest at this time. The employer has very little to gain by keeping the men in the shop and idle, in short, it is much better that he regulate his workday so that no objection can be offered to quitting the shop when the employes' task for the day is done. Molders, as a class, would have less objection to such shop regulations if they did not so often carry with them the curtailment of privileges, heretofore cheerfully granted. What is needed on both sides whenever anything new is being introduced is a little common sense.

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One of the most difficult tasks which the Iron Molders' Union has to accomplish is to bring foundries of the same class on as equal a base, as far as wages is concerned, as possible, in order that one may not have undue advantage over another. On the general principle

of business one employer can not afford to pay materially higher prices for labor than his competitors. We are reminded of the relatively low wages obtained by molders in certain sections of the country in these days of high pay, by two news items to the effect that molders are on strike for a minimum rate of two dollars a day.

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Gasoline is a very handy thing to have about the ordinary jobbing foundry, but it is a good deal like so much gunpowder and should be kept under cover at least. A western foundry, neglecting to take this precaution, witnessed an explosion through a spark of iron finding its way into a can of gasoline. Such accidents are caused by pure negligence and nothing more.

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There is just as much ability required in the business end of any industrial concern as there is in the manufacturing end. Some of the best molders in the land, men who can do a first-class job on any casting, and in many cases foundry foremen who have had practical charge of foundries for years, and made thousands of dollars for their employers, have been miserable failures whenever they attempted to operate a foundry on their own hook. They have had a plentiful supply of mechanical ability, but they have been sadly lacking in the requirements of the business end of the concern. It is my opinion that a poor mechanic with a head for business stands a far better chance of success than the one who has nothing but mechanical skill at his command.

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The ability of selling goods is as valuable as the ability to make them and I have always contended that our foundries needed more get-up in their selling methods. How many foundries can tell a customer why their castings are better than those made by others or why any part of their product is superior to that of their competitors. The answer is generally made that what is produced in the foundry has no talking points, but this can not be so. Take, for instance, a plow, and who would believe that very much could be said in the favor of any one style. The Beach Manufacturing Co. of Lyons, Mich., know better, however, and I am going to reprint a part of one of their circulars to show that such a simple thing as a plow has got talking points. Furthermore, I will bet that the Beach Mfg. Co. sell a lot of plows, that they make a good article and that they have confidence in their own goods. More than one foundry can get a lesson in advertising from the following:

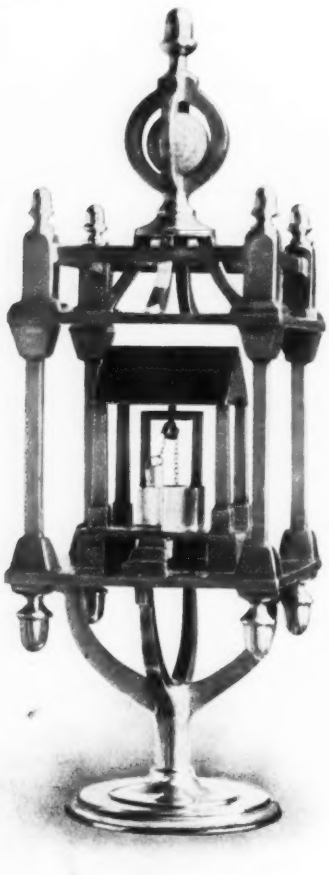
"We believe we have the best General Purpose Plow ever sold. There are very few farmers who can afford to have a different plow for each kind of soil—a sod plow, a stubble plow, a two-horse plow, or a three-horse plow, a plow that will not bury itself in soft ground, and a plow that will 'stay down' when the ground is hard; yet all of these conditions must be met every year by every farmer, and when we say we have a plow that will meet all of these requirements we mean it. The beam is spring steel and hooks in behind the standard, going nearly down to the point (in demonstrating this plow we have taken out every bolt in the beam, dropped it in place and done a good job of plowing), the beam on all other plows is bolted to standard or landside, and the full strain comes on the bolts; the bolts get bent, the landside works loose and opens up the joints and then 'the plow don't run like it used to.' This one feature ought to convince anyone of the durability of our plows.

"To hold our jointer we use a grip that goes around the beam instead of drilling holes through it to weaken it where there is the greatest need of strength; our jointer can be set at any angle by sliding it backward or forward on the beam; the wheel is adjustable sideways as well as up and down; the clevis is wide enough so all that is necessary to change from two to three horses is to move the small clevis; and we wish to say right here that it will work just as well with three horses as it will with two and just as well with two as it will with three; and when a dealer tells you a plow can not be used successfully for either two or three horses, he has never seen a Diamond Chill Plow at work or he is 'working' you to sell you two plows; the handles are of second growth white oak and finished in oil, so you can see just what you are getting; there are two rounds in the upper end of handles and two iron rods in the lower end to help support the moldboard (in addition to brace from moldboard to landside;) the handles are adjustable as to height and brace to the beam with two flat steel braces; these are also wide enough so you are not liable to get your ribs broken if the plow strikes a solid stone; in fact we do not think we have overlooked a single thing that could be made better. We have a long moldboard with a sure turn; we use a patent point that will wear twice as long

as a common point and will not break one-half as easily as a reversible point; is fitted with either steel or chilled board, jointer or coulter."

A Novel Casting.

The casting of which we show an illustration is a complicated affair and is, with the exception of the bucket and chain, made



THE OLD OAKEN BUCKET.

all in one piece. It was cast in brass by Mr. Dan Galvin, of Paducah, Ky. It stands 12 inches high and is 4 inches square at its greatest width.

Multiple Molding.

Referring to J. W. Harrison's method of multiple molding, as described in the August issue of THE FOUNDRY, and the claim to prior use made by Mr. E. C. Wills, in the September issue, it is very doubtful if Harrison's exact invention was ever used by the latter, especially for the purpose he states. Piling molds one above another is not a new idea, as was shown by references cited against Harrison, and I presume all that Mr. Wills did was what is shown in several other patented methods, such as Grebels' and S. J. Adams'. At any rate, Mr. Wills cannot now use what Harrison has patented, and it is his own fault if he has lost the benefits to be derived therefrom. If he had even published a description of his method he would have saved himself some trouble. That the readers of THE FOUNDRY may not knowingly infringe Mr. Harrison's patent I herewith give his claim which is as follows: "In an apparatus for casting small steel articles, a series of molds arranged in tiers and having horizontal gateway sections at the edge, and certain of the molds having vertical gate sections flared at the top, the said vertical gate sections when placed in alignment forming a single pouring gate common to all the horizontal gates, and a perforated casing flared downward and outward and engaging around the tiers of molds, there being a space between the tiers of molds and the casing to receive sand."

A. E. FAY.

The Traveling Supply Man.

BY SAM DUE.

They do say that if a practical traveling supply man for a concern making foundry materials feels so inclined he can give the buyer, let him be superintendent or foreman of a foundry, a houseful of interesting details about new, novel and economic ideas, from which great benefit may be derived. Who doubts this? If the supply man is of the observing kind, and practical, he can see a good thing instantly and won't forget it, and furthermore, he is anxious that this information shall not get rusty by being confined to one place. To test this, if you are in doubt about the mixture best suited for your work, the kind of sand to use for either floor or bench, the selection of a proper blacking for dry, loam, green sand or cores, chaplets or anchors, if you want to know current ideas of gating or rigging up match plates and flasks, fluxing and pouring iron, if you want to become acquainted with the best cupolas, and mixers, core making and molding machines, and anything else all the way down the line, it is a cinch that if you do not find his suggestions in accordance with

your own views on the subject, that you will at least learn something that is new and most interesting if not worth trying. If the supply man does not tell you all he knows, the only reason is that he hasn't sized you up as a good fellow or has not seen enough of you to make up his mind.

There is no question at all but that many are benefited by contact with him on a social basis and that they are a goodly number of the craft, too. A warm, friendly greeting and courteous treatment was never lost on this man. To gain his friendship and confidence has invariably been not only a pleasure and the means of keeping right up to date, but it follows that through him you will, sooner or later, be better acquainted with others holding similar positions as yourself, which is not to be despised by any means, especially after such a heart to heart meeting, and such a leveling basis as this fellow can put you on.

The experience which a capable supply man of this description gains cannot be estimated. His continual visits to the large number of foundries throughout his territory, place it within his reach to obtain knowledge of the way things are being done, probably only after a large expenditure and costly experiments. One pleasant feature is the small value he puts on this information, for, as I have said, the select are furnished it with a free hand. If one would take it upon himself to investigate he would quickly find that the majority of past masters in progressive foundries are great friends of these fellows, and if you are close enough when they meet you will find that they greet each other by their first name and immediately fall into a conversation, in which allusion is made to some of the former social meetings.

Among the social good fellows who are always anxious to meet the traveling supply man is the one in whom conceit dominates to such an extent that it prevents him from hearing what the visitor has to say. We allude to the supreme possessor of the knowledge of the business. He is generally, as I say, an awfully pleasant fellow to meet, but he consumes all the time the supply man can afford to spend with him, exploiting the easy manner in which he does everything. The result is that he does not learn anything new, though the visitor oftentimes receives more than one pointer worth remembering.

The most unsatisfactory class of people with whom the traveling supply man comes in contact is undoubtedly to be found in the person of the too young, college student buyer. He is invariably a relative of some heavy stockholder in the company, which manufactures some patented necessity. He would never have been appointed if his ability for the position had been a necessary qualification. He is generally a disappointed looking, emaciated, dyspeptic, jaundice complexioned, dried up, cigarette fiend, and never had any other idea since he was appointed but that the success of the concern was due wholly to his ability as a buyer. His stereotyped words to the salesman are "Write your prices on the back of your card and we will let you hear from us when in the market again." When the whole-souled pleasant supply man runs up against this, he loses his ability as a salesman. This is caused by the atmosphere in which this anti-live freak moves, it is coagulated with the frigidness of hoar frosts and when he goes away he swears he will never call there again unless he is convinced that he has sypmtoms of smallpox.

Generally in these places, where this class of buyers are employed it is impossible to get into the foundry. Therefore, the supply man never becomes acquainted with the foreman of the latter and seldom learns his name.

This poor boss convict, who never meets anyone who can tell him what is going on in other foundries, if he does not make a break for liberty and shake the place, at last, after years of discouragement becomes reconciled to his fate, becomes fossilized with old fogyism and finally dies in the rut. These shops are as canny as a penitentiary and the majority of poor young fellows who start in these foundries to learn the trade of molding are doomed, for they will never be able to make anything but the one thing on which they are engaged from day to day, and having no opportunity to learn, soon lose confidence in their own ability and hold on to that job for fear of not being able to work outside of this place, or else they die or go out on a farm.

The whole subject boiled down to a sensible sentence is: Decent treatment of traveling salesmen never, never, lost a cent for anyone. This is proved over and over again, and no one knows it any better than the up-to-date, progressive, thriving manufacturers, who are in the midst of the closest competition. They fully appreciate what can be gained by contact with them and the heads of any number of these concerns have gone through this experience and have graduated as salesmen.

A Lucky Drop.

A short time ago in one of the big steel foundries in the vicinity of St. Louis a 15-ton ladle full of molten steel, through the breaking of a chain, dropped three feet to the floor without causing any greater damage than the spilling of about 100 pounds of metal. It was a lucky drop, and the part of the floor where the ladle fell was almost level. Hardly anyone in the shop knew what a close escape a large number of men had had from death or injury. The question arises: What would have happened if the link which broke had retained its strength for one or two minutes longer, when the ladle would have been suspended at a distance of not less than 5 feet from the floor and above flasks which are poured on an incline? It would seem as if some sort of an inspection ought to be made of foundry chains used in hoisting ladles of metal at regular intervals to prevent any such accidents as sometimes do occur. It is really a wonder that they are not more numerous. J. C.

Some Foundry Bookkeeping.

That a little knowledge is a dangerous thing gets many illustrations, some of which, at least, tend to show that any rule or system that is followed too closely may lead to curious and undesirable results. A little good hard common sense with a poor rule or system may often surpass a much better one which is applied inflexibly and without regard to modifying conditions.

There is a foundry foreman, a level headed, ambitious young man, who believes in using all modern facilities he can, and while not trying to overtax his men, does wish to make each move count for as much as possible.

He is working for a large corporation that keeps close track of all its business, so that they can tell just how much a pound their iron costs in any condition from pig and scrap to finished castings; how much core and molding sand, molasses and plumbago and everything else is used to each ton of castings made. It is even hinted in some quarters that the office can tell to within a few minutes just when a shovel, brush or wheelbarrow will be called for.

Under such a good and complete system it is easy to see that if for any reason the cost of castings begins to go up the foundry foreman is pretty apt to be called down at least a corresponding amount.

When a large concern gets to the place where it finds it necessary to change foremen because the outgoing man did not suit, the new one generally finds many things to change and remedy, and so it was with my friend.

Much of the work, in fact most of it, was made up and finished and sold in the open market in competition with others in similar lines.

Some of the first work undertaken by the new foreman was replacing old, rickety, wooden flasks with iron ones, and where they were intended for regular work that had a steady run, they were made of such shapes as to need as little sand as possible, so as to keep down the labor of handling, etc.

In connection with this class of work a condition of affairs came up that proves the first assertion made.

The patterns on some light work were found defective to the point of being non-repairable and new ones were gotten out. The castings were light. I cannot give the exact weight, but that is not essential; they weighed about 13 pounds each, and a man could mold about 60 in a day, which, if they were all good, would give 780 pounds of castings.

Strength was not a consideration. They were amply strong when as light as they could be made. After looking things over carefully our friend decided that with good stiff flasks, a true pattern and hot iron, he could considerably reduce the weight and get equally as sound castings with as small a loss, and as they were not sold by weight, but at so much each, any gain in weight would benefit the firm to that extent and either enable them to have more profit, which might at some time reflect back on him in an increase of salary, or else enable them more readily to meet competition, which might mean steadier work for the shop. In either case, good would result.

The improvements enabled him to make good castings that weighed about 10 pounds each, thus making a saving of 3 pounds each, besides getting a much nicer looking casting.

The added facilities also made it so the molder could now put up 70 for a day's work.

Here, indeed, was progress, 3 pounds each from 70 castings and moldings, costs reduced one-sixth, that made 210 pounds of iron and 40 cents in molding saved, besides castings that were a credit to the molder, the foreman, and the firm.

That there was an entirely different side did not strike him just then.

Just imagine (if you can) a report that showed up something like this: With old patterns and flasks, 780 pounds castings. With new patterns and flasks, 700 pounds castings. Loss, 80 pounds; equals over 10 per cent, and then, it was in black and white, and no doubt of it, and if enough improvements were made and enough weight saved, our progressive man saw that he might get the reputation of being the most expensive man the firm ever had.

He was somewhat anxious to know if there was not somewhere in bookkeeping something that showed just what the foundry was doing.

If those castings were credited to the foundry at so much per pound and the machine shop was credited with so much each for finishing them, the store getting the credit for the difference for selling them, it would be a snap for the store.

Of course it may be said it was all in the family, and was only taking it out of one pocket and putting it into another, but enough of it might easily take the keen edge off a man's ambition, as a man dislikes to have a report make it appear he is going backward when his own common sense tells him he is going the other way.

His first impressions had made him think that, carried far enough, his improvements would fill the coffers of the firm with gold, but the bookkeeper's indicator pointed unmistakably to the poor-house, and *he* is only a molder.

W. OSBORNE.

Specifications for Testing Cast Iron.

To the Editor:

Among your September editorials I notice one criticising the specifications for testing cast iron recently adopted by the American Foundrymen's Association. My somewhat lengthy stay in Europe must be the excuse for the lateness of this letter in which, on behalf of the late committee, I wish to explain what you point out as inconsistencies, and which in the absence of the underlying facts might readily be considered as such.

In the first place it had better be understood that three sets of people have to do with the handling of the foundry product. The founder who makes it, the buyer, and the impartial expert who may be called in by the buyer, the founder, or both. A set of specifications which would please the founder only is certainly a worthless document; specifications to please the buyer only might be an injustice to the foundry trade. A set, however, which is fair to the founder as well as the buyer, if this can be produced at all, is in line with the present tendency of commerce. Furthermore, the customs of the past must not be ignored either, for many a buyer will not give up a clause in his specifications, even if it appears inconsistent to others, simply because he thinks that his experience has shown the desirability therefor. This will account for paragraph eight of the specifications in question, which provides for the method of procedure where a chemical composition is required in addition to physical tests.

It so happens that some specifications, while calling for given tensile and transverse tests, demand that the castings shall not exceed so much sulphur or phosphorus. In view of the fact that a casting may stand up very well under a pull, or bend, and yet fail badly under shock, it would seem that the limiting of the causes of this tendency is good practice. The clause of the specifications covering this point therefore aims at a fair sample to work upon, and cuts out the uncertain graphite and combined carbon contents.

The buyer is not authorized by us to specify both chemical and physical tests by any means, but when the buyer does so, the foundryman is protected as much as possible against unfair treatment. Again, if a buyer should specify the chemical composition, you do not think that he should be allowed to call for certain physical tests in addition, yet this is done with car wheel irons right along. A given chemical composition is necessary to insure wearing qualities, and physical tests insure the use of high grade irons of the required composition.

It would seem to me that the specifications are not so illiberal to foundrymen, for in clause *one* the attempt is made to place the making of ordinary castings into the hands of the trade, as against those who wish to tell us how to do the work. Except in extraordinary cases no trouble need be anticipated on this account, even though no less influential a buyer than our Government not only specifies tests in the making of its cast iron mortars, but tells just how the work must be conducted. The specifications, as a foundry proposition, are interesting reading matter.

I have personally made many tons of castings for railroads under specifications in which chemical limits, physical tests, and special molding methods for important parts were laid down very strictly, and know that these things are met with elsewhere. The Com-

mittee, therefore, in taking issue with these conditions, did not go out of its way, whether foundrymen as a whole like to subscribe to the findings or not.

The general liberality of the specifications may be seen further from the fact that it is left to the founder and buyer to get together and place the limits for cutting out imperfect work, for we all know that a tough looking casting at 1.4c a lb. may be passable where it would not be at 2⅛ cents.

So far as the recommendations for molding test bars are concerned, our Mr. West will doubtless add a few remarks of his own, as he took care of that end of our work exclusively. I will only say from my own experience that I have taken my best molders for ramming up flasks with the test bars in a vertical position, and you would hate to look at the castings. Once they have learnt the trick, however, the work came out perfectly satisfactory. The molders were simply inexperienced in this line.

Finally you poke a little fun at us for specifying a test bar 2 inches in diameter for sash-weight iron. In classifying the various irons of the market, a name had to be found for the foundry offal, for material which goes into sash weights, floor plates, grate bars, annealing pots, and for many other uses. This material may be burnt and rotten, but still contain 1.50 to 2.00 per cent of silicon and go into sash weights and floor plates, as I happen to know. On the other hand the material may be high grade charcoal iron mixed with malleable and steel scrap, low in silicon, and go into annealing boxes. It was hardly supposed that anyone would write out specifications for the sash weights he buys, but the list seemed incomplete without mentioning every known variety of cast iron, and giving the foundry trade the result of a very elaborate series of investigations.

The committee wishes to thank you for this opportunity to ventilate a subject which is getting to be a vital one with some of us, and may in the near future be seriously felt by the trade at large.

RICHARD MOLDENKE.

New York, Nov. 2, 1901.

To the Editor:

Having seen a copy of Dr. Moldenke's reply to your September editorial criticising the American Foundrymen's Association specifications for testing cast iron, and, noting his suggestion that I reply to the criticism upon the system of molding the test bars, I will first take up the question of the conical shape of the bottom of the test bars commented upon, and which says:

"The recommendations for molding test bars accompanying these specifications contain a few suggestions that are, to say the least, open to discussion. It is stated that the conical shape of the bottom of the mold for the test bars presents a sloping surface to the dropping iron and prevents cutting. As the mold is gated through the top and the iron falls directly in the center of the mold it is somewhat difficult to see where the least protection is offered. The fact that the iron falls on a slight slanting surface will not prevent the mold from cutting if it is made from a material likely to show this defect."

The principle involved in making the bottom of the test bars conical or pointed, as shown, is one followed by all experienced molders in forming the bottom of pouring gates and pouring basins to reduce the chances of the first fall of metal cutting the sand. Are there any experienced molders who will dispute that the same flow of metal through a ⅞-inch gate, having a drop of 15 inches onto a strictly flat green sand surface of 2½ inches diameter, as is presented by some of these test bars, will not cut the sand more than if it dropped onto a smaller area, or, as it were, into a little well or depression as provided by the conical end of the bars in question? Then again, by having a small body of metal in this depression, instead of a very thin layer on an otherwise large flat surface, the falling flow of metal is stopped more easily from cutting. It is moreover just as easy, if not easier, to mold the bottom conical instead of flat, in making a solid bottom.

The next criticism on the molding is on the sentence, "the only advantage of molding (test bars) flat lies in the greater certainty of bars free from swells, when made by inexperienced molders." This does not mean that the committee recommends that inexperienced molders should be selected to make the test bars, but merely points out that if this is the case, as in many shops it must be, they will have a better chance of obtaining bars free of swells by molding them flat than on end. There are many foundries in this country having molders, so called, that could not make a good even test bar on end upon the first trial, or in fact make a set of true solid test bars by ramming flat or any other way without instruction, and when such shops are made

to prepare for a system of testing, they will surely have to do as all humanity has had to, "to learn by experience," and make an effort to master new processes. These shops will have to experiment if they adopt the whirl gates suggested until they get the best results, or by soliciting information from the many channels open, to save the cost of experimenting. Shops which have molders worthy of the name, need no instruction from anyone in order to obtain true, even, solid test bars, cast on end or any other way. However, the plans of molding suggested are so simple that any fairly intelligent man must be a mighty poor tool of a mechanic who cannot, after a few trials, make true, even, solid test bars, if he will accept the information offered. The methods shown are the simplest, in the writer's estimation, to obtain solid, uniform test bars, in greatest number, that could be offered. If the criticism made is all that can be pointed out as being objectionable to the specifications for testing cast iron as adopted by the American Foundrymen's Association at Buffalo last June, the committee may well believe that their work was ably and impartially performed for the interest of the trade and those interested in the use of cast iron.

THOS. D. WEST.

Among the Foundries.

The Empire Brass Manufacturing Co., of Cleveland, O., has been incorporated with $20,000 capital for the purpose of conducting a brass foundry. F. Nohius, V. M. Wellman, G. W. Nahius, S. O. G. Morris and E. C. Kelley are the incorporators.

The Abendroth & Root Manufacturing Co., manufacturers of spiral riveted pipe, straight riveted pipe and water-tube boilers, shortly after the destruction of their plant in Brooklyn, N. Y., bought out the old plant of the Wright Steam Engine Works at Newburgh, N. Y. They are making extensive alterations and additions to the plant, adding to it a boiler and sheet iron shop 100x200 feet, a galvanizing shop 100x100 feet. The new works are splendidly located and have excellent shipping facilities by both rail and water.

The Alabama Manufacturing Co., of which Samuel D. Jones is the head, has leased 80 convicts from the state of Alabama and propose to utilize them in its iron hollow-ware plant now being built at North Birmingham, Ala.

The R. M. Eddy Foundry Co., Chicago, will increase its foundry by the erection of an addition 50 feet wide and 100 feet long.

The Chandler & Taylor Co., Indianapolis, Ind., has purchased 22 acres of land between the tracks of the Big Four and Vandalia roads as the site for its new plant. The first building to be built is the foundry, which will be 160x250 feet, and later a machine shop and boiler shop will be erected. All the buildings will be equipped with modern tools and machinery throughout. It is the intention of the company to abandon its present shops as rapidly as the new buildings are erected.

The Ideal Foundry Co., of Miles Grove, Pa., and the International Range & Manufacturing Co., of Ashtabula, O., have consolidated. The company which has just filed incorporation papers will be known as the Ideal Foundry Co., and is capitalized at $40,000. The Pennsylvania plant will be moved to Ashtabula. O. R. Hanchett is president and H. H. Hanchett secretary.

The West Mansfield Foundry Co., of West Mansfield, O., has been incorporated with $9,000 capital. G. F. Plotner, S. G. Fisher, T. F. Wilson, J. R. Marsh, Joseph Beltzer, E. Hathaway and C. C. Keller are the incorporators.

The Lalance & Grosjean Co., Harrisburg, Pa., is erecting a new foundry, 40x70 feet. It will furnish castings for use in their own works exclusively.

The American Radiator Co. has purchased a large plot of ground at Buffalo, on which it is expected a new plant will be erected.

The partnership lately existing between W. E. Campbell and John R. Davis, carrying on a general foundry business at Alexandria, Ind., under the style of Campbell & Davis, has been dissolved by mutual consent. The business will be continued by John R. Davis.

The Sterling Iron Works, Springfield, Mo., have incorporated with a capital of $50,000, to conduct a general foundry and machine business. The large plant formerly occupied by the Springfield Stove Works has been secured, in addition to which new blacksmith and boiler shops, 50x120 feet, will be erected. New and modern machinery is being installed and the plant otherwise improved. They expect to start up about December 1. The officers and directors are H. C. Mosher, president; H. T. Hornsby, vice-president and treasurer; R. P. Bowyer, secretary; Arch. McGregor, O. L. Milligan, H. F. Fellows and William B. Sanford. Messrs. Mosher and Hornsby were formerly connected with the Crescent Iron

Works, and Mr. McGregor is a member of the McGregor-Noe Hardware Co.

The Culter & Proctor Stove Co., of Peoria, Ill., is making additions to its foundry to meet the demand for its popular line of stoves and ranges.

The Massillon (Ohio) Iron & Steel Co. has awarded to the Massillon Bridge Co. the contract for the erection of an addition, 100 feet square, to the main building of the plant, whose dimensions, when completed, will be 350x100 feet. The addition will be constructed of steel. The company expects to later add to the main structure a south wing, 150x100 feet, space for which has been reserved and cleared. The addition will be fitted with an electric crane and all of the other things that make a pipe works equipment modern and complete. The new structure will be a jobbing foundry, where will be made all the fittings used in connection with iron pipe.

The Sinking Spring (Pa.) Foundry Co. is extending its foundry by a 40-foot addition.

The Lorain Steel Co., Johnstown, Pa., have let contracts and broken ground for an addition to their steel foundry. The contract for the building complete has been awarded to the Penn Bridge Co., of Beaver Falls, Pa. Geo. P. Suppes, assistant purchasing agent of the Lorain Steel Co., is making arrangements for new equipment.

The Scullin-Gallagher Iron & Steel Co., St. Louis, Mo., are about to extend their molding and chipping floors 200 feet.

The American Foundry Co., recently incorporated, have located at 135 Herman street, Buffalo, N. Y. The company will make a specialty of castings for automobiles, air cooled and water cooled cylinders and heads of semi-steel by an entirely new method and process of casting. H. C. Caldwell is general manager.

Dienelt & Eisenhardt are building an addition, 34x60 feet, to their foundry on Marcher street, Philadelphia, Pa.

The Athens Foundry & Machine Works, Athens, Ga., were incorporated with a capital stock of $15,000, with the privilege of increasing it to $25,000. The president is John R. White, general manager J. A. Norton, and superintendent J. H. Houchin. They occupy the plant of the old Athens Foundry & Machine Works. The old machinery is being reconstructed and new machines have been installed with the view of enabling the company to manufacture power transmission machinery. They intend devoting particular attention to this line.

The foundry business carried on for the last ten years at Richford, Vt., by H. C. Ayer, with W. S. Foster as general manager, has been incorporated under the name of the Richford Foundry Co. H. C. Ayer is president, and W. S. Foster secretary and treasurer.

The Diamond Drill & Machine Co. is erecting a large plant at Birdsboro, Pa., and will go into the manufacture of steel castings.

The Hardwick Machine Works, 177 Elm street, Dallas, Texas, engineers, machinists and founders, recently organized, are building a new foundry and machine shop, which will be thoroughly up to date in every respect. The officers are S. W. Hardwick, president and general manager; W. B. Pate, vice-president, and A. M. Jones, secretary and treasurer.

The Sessions Foundry Co., of Bristol, Conn., will at once erect an addition to the main foundry building 100 feet long, 110 feet wide. This will make the main building 630 feet in length.

Wm. Beatty has purchased the foundry at Milton, Ont., lately occupied by J. Johnson.

Frank Hamacheck is building an addition to his foundry at Kewanee, Wis.

Norbeck & Nicholson are remodeling their foundry at Redfield, S. D., which they recently purchased from W. S. Gregory.

The Norway Iron & Steel Co., York, Pa., have about completed the erection of a 10-ton open-hearth steel furnace, and will shortly begin the manufacture of steel castings as well as malleable castings. A new cupola is also to be installed. All departments of their large plant are being operated to their full capacity, and the business conditions generally are considered favorable.

The Waterous Engine Works Co., of St. Paul, Minn., will erect a foundry in the near future.

Gilbert Combs has retired from the firm of Combs & Bawden, proprietors of the Freehold Iron Foundry & Machine Shop, Freehold, N. J. John H. Bawden, the junior member of the firm, will take in partnership his son, John H. Bawden, Jr., and his son-in-law, Herbert J. McMurtrie. The new firm will be known as J. H. Bawden & Co.

Lewis C. Welden & Co., Phillipsburg, N. J., have leased the Drinkhouse foundry and machine plant in that city, and after making the

necessary improvements will operate it, doing a general foundry and machine business.

The Racine Steel & Iron Manufacturing Co., Racine, Wis., have placed contracts for important additions to their plant. They will build an extension to the foundry, to be 70x150 feet, and an extension to the machine shop, 60x130 feet. Both these buildings will be constructed of brick, with stone foundations.

Davis & Ludwig Foundry Co., Chicago, Ill., are having plans prepared for a new plant to be built near Twentieth street and Western avenue. Their present quarters have grown too small and the new foundry will be equipped with modern tools and appliances.

The Eynon-Evans Manufacturing Co., of Philadelphia, Pa., have just completed a large new core oven for their brass foundry, which, together with a recent addition to their cleaning shed, will enable them to handle their increasing business to greater advantage. When improvements which are now being made to the foundry are completed they will have a modern and most complete shop in every particular.

The Northwestern Malleable Iron Co., Milwaukee, have purchased additional land, 245x625 feet, whereon it is intended to build a new foundry 70x450 feet. This will make a total length of 2,500 feet of foundries, giving 170,000 square feet of molding room. Two additional melting furnaces are to be purchased, giving the company a capacity of 100 tons of malleable castings per day. The entire plant is being electrically equipped. Industrial railway, pneumatic hoists, etc., are to be installed. The officers of the company are Frederick W. Sivyer, president, and William A. Draves, vice-president.

The Mueller Mfg. Co., of Decatur, Ill., is building a new brass foundry 44x155 feet in size and will install therein twenty-four new furnaces.

Samuel Morgan has started a brass foundry at Richmond, Ind., and will make a specialty of ornamental castings and pattern work.

Baker Bros., of Platteville, Wis., expect to erect a foundry early next spring. They will manufacture mining machinery and do general casting.

The Charles Creighton Foundry Co., of New York City, has been incorporated with a capital of $100,000 by J. H. Kugler, Paul W. Ryder and Edw. S. Chambless.

The Imperial Engine Co., Ltd., has been organized at Woodstock, Ont., to manufacture engines and conduct a general foundry and machine shop. The capital is $600,000. W. O. Taylor, W. T. McMullen, R. N. Ball, J. N. Greenshields and W. H. Laurie are the directors.

The Norwich Iron Works, Norwich, N. Y., a new concern of which W. W. Smith is general manager, O. R. Munson foreman and F. L. Ridley secretary and treasurer, have opened up a new iron and brass foundry at that place.

The Chattanooga Plow Co., Chattanooga, Tenn., are erecting an addition to the foundry 60x96 feet, and a new paint shop 64x128 feet, both of brick. The company report business as excellent.

The new foundry and machine shops of the Lewis Foundry & Machine Co., under erection for some time at Coraopolis, Pa., on the line of the Pittsburg & Lake Erie Railroad, and about 10 miles from Pittsburg, are nearly completed. The concern expect to occupy these new shops in a short time, and will then abandon their present plant on the South Side, which has become too small to accommodate their increasing business in the manufacture of rolls and rolling mill machinery of all kinds.

The Charlotte Pipe & Foundry Co. has obtained a charter to do business at Charlotte, N. C. Its capital stock is $10,000.

The A. W. Stevens Co., of Marinette, Wis., will double the capacity of its foundry.

The New Departure Bell Co., of Bristol, Conn., will build a new brass foundry 58x63 feet in size.

The Ohio Machine Co., Middleport, Ohio, is making preparations to increase the capacity of its foundry.

C. W. Seavey will extend his plant at New Paynesville, Minn.

The Gate City Stove Works has been chartered to do business at Catlettsburg, Ky. J. P. McCloskey and C. F. Wilson are among the organizers.

The Illinois Stove Co., with offices at 401 Tacoma Bldg., Chicago, is reported as having decided upon locating their plant at St. Joseph, Mich.

McClave, Brooks & Co., of Scranton, Pa., are preparing plans for a new and larger plant.

The Concordia (Kansas) Iron Works will add a 40x60 ft. extension to its foundry.

The Cole Manufacturing Co., of Chicago, makers of stoves, will build a three-story plant at 35th street and Western avenue to occupy a space of 50x150 feet.

The H. N. Strait Mfg. Co., of Kansas City,

Kas., is preparing plans for a new plant which will include a foundry 100x200 feet.

Among other buildings being erected by the Atlas Engine Works of Indianapolis, is a foundry for heavy castings 120x500 feet and a special shop for machine molded castings 70x300 feet.

D. M. Swain, of Stillwater, Minn., builder of engines, is extending his foundry and machine shop.

Clement Einsweiler has started a foundry at Galena, Ill., and will do a general line of jobbing work.

The Seybold Foundry Co., of Dayton, Ohio, has been incorporated with a capital stock of $50,000 by Charles Seybold, Charles Passe, Joseph Burns, Frederick Brodmiller and J. Edward Sauer.

George Greasby has opened a foundry at Albia, Iowa, where he will make a specialty of mine car wheels and steam and hot water appliances.

Cochran & Crawford will erect a new foundry at Sterling, Ill., which will do a jobbing business exclusively. Mr. Cochran was for several years superintendent of the Keystone Mfg. Co.

G. L. Anderson, who has until recently been at the head of the G. L. Anderson Brass & Bronze Co. of Birmingham, Ala., has disposed of his interests in the latter concern and will build an independent plant for the manufacture of brass and bronze castings.

Charles Clarage, of Kalamazoo, Mich., will build a new foundry at that place. The business now being carried on under the name of Clarage & Son will be continued as a separate concern, although it is probable that this will later on be absorbed by Mr. Clarage. It is now controlled by the Clarage estate, but is not equipped to do the heavier class of casting which the new shop will be able to handle.

The National Foundry & Mfg. Co. has been organized at Terre Haute, Ind., with a capital of $25,000 by John B. Bergman, Wm. B. Graham and B. F. Brown.

The Connorite Mfg. Co. has been organized at Port Washington, Wis., to manufacture white metal castings after a process by which they are expected to replace brass castings and do away with the necessity of nickel plating. The capital stock of the new concern is $10,000. John F. O'Connor is president; A. R. Boerner, vice-president; G. E. Henry, treasurer, and H. W. Boles, secretary.

Deaths.

Arthur R. Heintz, one of the proprietors of the Pacific Iron Works, Portland, Ore., died at his home on October 10, aged 43 years. He was one of the organizers of this company, which is one of the best known on the entire Pacific Coast.

Charles G. Zehm, formerly at the head of the Kutztown Foundry & Machine Works, Kutztown, Pa., died on October 4 of dropsy, aged 70 years. He was born in Germany and came to the United States when a young man. Mr. Zehm was connected with the Kutztown Foundry and Machine Works for nearly 40 years, retiring six years ago.

William Parham, iron founder, of Westmoreland Road, Bath, England, died recently, aged 70.

Leslie W. Young, for some years connected with Joshua Rhodes & Co., of Pittsburg, died at his home on Thursday, October 24, aged 30 years. He was ill but a few days with pneumonia. For one of his years Mr. Young was well known to the iron and steel trade not only of Pittsburg and the immediate vicinity, but to the general Western trade. When the Cherry Valley furnace was acquired by the Rhodes interests, Mr. Young was made treasurer of the company, and when the Fort Pitt Iron Co. was organized he was likewise elected treasurer.

Joseph E. Fales, retired member of the firm of Rice, Barton & Fales, Worcester, Mass., died at his home October 21, at the age of 91 years.

The death occurred on October 24, in his seventy-sixth year, of Edward C. Lewis, president of the Waterbury Farrel Foundry & Machine Co. of Waterbury, Conn. Mr. Lewis was born at Welsh Pool, North Wales, and came to this country with his parents in 1831, locating in Bridgeport, Conn. In 1849 he went to Ansonia as foreman for the Farrel Foundry & Machine Co., subsequently removing to the company's Waterbury plant in a similar capacity. By his executive ability and thorough knowledge of the business Mr. Lewis rose until he became the principal owner and president of the concern. He was closely identified with the industrial growth of Waterbury, and was interested in no less than 27 different business and manufacturing enterprises in that and other Connecticut towns.

Charles F. Smalley, a well-known manufacturer of agricultural machinery at Manitowoc, Wis., died on October 21, aged 44 years.

D. P. Pattin, of the firm of Pattin Bros. &

Co., Marietta, Ohio, was killed in an explosion of gas at the works October 20, which wrecked the greater part of the plant, entailing a loss of $15,000.

Fires.

B. C. Beach & Co.'s foundry at Winchester, Ont., burned October 19.

Fire badly damaged the foundry of L. C. Tarras & Co. at Winona, Minn., October 22.

H. G. Hart's foundry at Salem, N. J., was burned October 31. Loss $5,000.

J. Alfred Clark's foundry, 35th street and Gray's Ferry Road, Philadelphia, was damaged November 4 to the extent of $5,000 by a fire of unknown origin.

The C. B. & Q. brass foundry at Aurora, Ill., burned November 1.

The St. Louis (Mo.) Iron & Steel Foundry Co. suffered a loss of $10,000 through a fire in its foundry November 5.

The Tyler (Tex.) Foundry & Machine Co. had its plant destroyed by fire November 6. It will be rebuilt at once.

The Tropenas Converter Steel Process.*

BY A. TROPENAS.

During recent years many processes for manufacturing steel by means of small converters have been introduced. They have been tried industrially and in most cases abandoned because the extraordinary advantages claimed for them by their inventors have not materialized in practice or have proven to be greatly exaggerated. The failure of nearly all of these processes to realize the absolutely necessary conditions of practical metallurgy has brought into existence a considerable prejudice against the use of small converters and many manufacturers have come to the conclusion that it is impossible to make a good product in such a way.

The first Tropenas converter used was of a capacity of about 800 pounds and was erected in 1891-2 in the works of Edgar Allen & Co., Ltd., Sheffield, England. The trials there made were so satisfactory that after a few weeks the above named firm decided to build a two-ton converter, and since then two others of like capacity have been erected with which all its steel castings are made. The output of the works at the present time is over 9,000 tons per year. Some twenty Tropenas plants with over fifty converters are now running in Europe and nine plants with thirteen converters are in operation in the United States and Canada.

In all of these works the manufacture of general steel castings for machinery and electrical purposes has been carried on with great success, fulfilling all the physical and chemical requirements. Some ingots have also been made as well as anvils, hammers and similar articles. Steel castings have been made in some recent plants for the United States Government and from the published test tables it can be seen that the material was accepted and of first quality. The ultimate strength is 65,000 to 73,500 pounds per square inch. The elastic limit 30,000 to 38,000 pounds per square inch. The elongation in 2 inches, 27 to 37 per cent, and the reduction in area 45 to 57 per cent.

Dynamo Magnet steel of extreme purity and permeability can be made with absolute regularity and tests made both in Europe and here show that the product has a permeability not equalled by steel made with any other process.

Large or small castings can be made at will. Small and medium castings are specially made with great facility, sound, free from blow holes, and of a high physical quality. The manufacture of these small and medium castings take in a field which heretofore it has not been possible to cover with other known steel processes. Though one is specially enabled to make small castings with success, the Tropenas process is also well adapted for large castings weighing up to ten tons. This can be done by running two two-ton converters alternately and collecting the steel after each operation in a ladle until the required amount is reached. This is made possible owing to the great heat and consequent fluidity of the metal It has been found in past years that even with obsolete types of cranes and foundry appliances five or six blows could be collected in this way and afterwards poured over the lip of the ladle, leaving no skull. Today with modern foundry machinery, especially cranes, it is possible to make much heavier castings with a double two-ton plant. Castings up to five tons can be made with one two-ton converter in the same manner. The first and second heats will remain hot long enough to accomplish this, and it frequently happens that castings, are made with steel a portion of which has remained in the ladle for more than two hours.

*Journal American Foundrymens Association.

The Tropenas process consists of a special converter in which iron, melted in a cupola beforehand, is converted into steel. This vessel like all other converters is a sheet steel shell lined with silica bricks or ganister. The shell is fitted with two hollow trunnions carried on pedestals so that the apparatus may be tilted according to the requirements of the operation, i. e., charging the molten iron, pouring the steel, etc. The interior of the converter is so designed that the metallic bath has a much greater depth than in all the other pneumatic processes. The blast enters the converters from the pressure blower through the trunnions, feeding the wind boxes and tuyeres—which direct the air over the metallic bath.

Before commencing operations the converter is heated by means of coke or crude oil, afterwards no fuel is needed in the converter, as it is supplied by the metalloids in the iron which are to be eliminated. The pig iron and steel scrap having been melted in a cupola or other furnace is run into the converter; the position of the converter relative to the level of the metal is then adjusted so as to have the proper conditions for blowing. The blast is started and at a certain period of the operation supplementary blast is introduced at will by means of the auxiliary tuyeres. This completes the combustion of the escaping gases, raising the temperature of the bath by radiation. At the end of the operation a bath of very fluid and soft metal is the result and recarburization is made in the vessel or in the ladle as in other steel processes. By varying the final additions steel of any desired hardness or quality may be produced exactly.

The blast pressure required varies between three and four pounds per square inch according to the kind of pig iron treated. The blast can be produced by means of a blowing engine or a positive pressure rotary blower.

By what has been said above, it is apparent that the characteristic features of the Tropenas process are the following:

1st. Low pressure blast, always above the surface of the metal.

2nd. Special disposition of the tuyeres in the horizontal plane so that the jets of air will enter into the converter above the bath and will not impart to it any gyratory or tumultuous motion whatever.

3rd. Great depths of the metallic bath so as to avoid churning and stirring during the operation. The result is that the steel contains very little occluded gas and therefore pours quietly into the molds, producing castings free from blow holes.

4th. Arrangement above the "fining tuyeres" and independent of the latter, of auxiliary or "combustion tuyeres," so as to burn the combustible gases which escape from the bath and which in all other pneumatic processes pass unconsumed up the chimney. The combustion of these gases increases the temperature of the bath by radiation very considerably. This makes the subsequent manipulation of the steel in pouring, etc., much easier and more satisfactory. As many as 150 molds have been poured from a heat of about 3,500 pounds, with bull ladles, holding about 125 pounds each. In making large castings it is often necessary to add cold scrap to the steel in the ladle or let it stand exposed to the air some minutes to cool before pouring.

By the use of auxiliary tuyeres the carbonic oxide arising from the bath is transformed into carbonic acid gas. By burning these gases in a practical manner, which in all the other processes are discharged without burning into the atmosphere, as stated above, the temperature of the final steel is much increased without any additional cost.

Every practical foundryman knows that the best results are obtained with metal suitable in temperature for the class and weight of the castings to be made.

The Tropenas process has this advantage that being so very hot at first, a great number of the lightest castings can be poured just before the steel commences to get thick, and then the larger castings are taken care of. Using always lip pouring ladles for large and small castings alike, one is able to judge from the surface of the metal its suitability as to temperature for any purpose.

Though the metallic bath is practically quiet during the operation, the reactions caused by the fining blast are quite sufficient to secure a perfect homogeneity of the charge. This is clearly demonstrated when we pour a two-ton heat into bull ladles for small castings. The steel as shown by analysis is found to be absolutely the same from the first to the last ladle.

The loss of metal during the operation, including cupola and converter is about 17 per cent. It varies 1 to 2 per cent, according to the kind of material used and the ability of the melters. This is not excessive if it is considered that the loss in cupolas alone is generally from 5 to 7 per cent, and that the iron

to be treated usually contains from 5 to 7 per cent silicon, carbon and manganese to be eliminated. It is scarcely correct to speak of the removal of these elements as a loss, for while being eliminated they serve the useful purpose of raising the temperature of the bath, thus doing away with the necessity for any other additional fuel, as previously stated.

The pig iron used for the production of steel castings analyzes as follows: Silicon, 2 to 4 per cent. Manganese, .50 to 1.25 per cent. Carbon, 3 to 4.50 per cent. Sulphur up to .06 per cent. Phosphorus, up to .07 per cent.

When the steel produced is to be submitted to particularly severe tests, it is better to use pig iron as low in sulphur and phosphorus as possible. When the requirements are only those for the machinery trade, iron up to .07 per cent of phosphorus can be used.

The sands required for making molds are the same as used in other steel foundries and the molds are dried or not according to the kind of castings to be made. Many small and medium castings are made in green sand molds.

The steel as it comes from the sand is perfectly soft and malleable. The great majority of the castings delivered to the machinery trade are neither reheated nor annealed. Where castings, however, have great or uneven thicknesses or when they are intended for special purposes, it is sometimes necessary to anneal them. The object of this annealing being to simply transform the crystalline structure or to relieve the molecular tension due to shrinkage. Tests made on unannealed pieces have shown that in many cases annealing is entirely unnecessary.

In cupolas used in connection with converters it is advisable to leave a greater depth below the tuyeres than is the case where the cupola is only used for ordinary work. This is done so as to hold more metal. The air blast for the converter is usually produced by a positive pressure rotary blower. The final additions for the converter are melted in a crucible furnace or a small cupola.

Each operation in the converter lasts from 12 to 20 minutes. The time required for pouring the steel into the ladles and preparing the converter for another blow varies according to the style of castings made. Whenever small castings are manufactured and the whole charge has to be poured into hand ladles, 40 minutes are required for a complete operation. When the pouring is done with large ladles only 30 minutes are required. In the first case 10 blows, equivalent to 20 tons of steel, can be made in seven hours. In the second case 10 blows, equivalent to 20 tons of steel, can be made in five hours. One of the foundries using this process recently stated that they had made 11 blows in an average of 25½ minutes per blow with one two-ton converter.

The tuyeres used last on an average 30 operations without renewal. With proper care they can be made to last longer. If a large number of operations are carried on at one time, and work is as continuous as possible with the same converter, the lining will last longer than with intermittent operations. Usually patching is begun after 20 blows, keeping this up and making about 150 blows before removing the tuyere and setting a new one. The linings are made with silica brick or ganister. The tuyeres are made in blocks of practically the same material as the lining.

The cost of producing steel varies with the price of raw materials, the output, and the foundry appliances. One can, therefore, only give a rough estimate based upon the practical experience of modern foundries. If the price of pig iron is $17, the waste being estimated at 17 per cent, the cost of the steel will be: $17 divided by .83 plus proportional expenses of all other material and labor. This includes all raw materials used in the production of the steel, coke, ferro's, bricks, chemicals, etc. The labor includes that at the cupola and the converter, the chemist, etc. For an output of from 300 to 400 tons of steel per month, necessitating three two-ton converters, labor and raw material taken at present prices, the proportional expenses alone will be about $4.70 per ton and the labor $1.80 per ton. Total cost will be about $17 divided by .83 plus $4.70 plus $1.80; or $26.98 per ton.

So far as blow holes are concerned it may be said that if they are found in the castings it is attributable to defective molds or to the manner of casting. When the molds are properly prepared and dried and the metal is poured as it should be, the castings are free from blow holes. Fifty thousand tons of steel castings per annum are now produced by the Tropenas process, and the marked favor with which they have been received everywhere shows that they give satisfaction and are successfully meeting all the requirements of the trade. The castings of ordinary soft quality weld as well as the best soft steels.

Commenting upon the Tropenas Process Richard Moldenke says that there seems to be

a great future before the process in the manufacture of specialties for which it is particularly well adapted. There has been considerable controversy as to the quality of Tropenas steel. Some people said that it was as brittle as cast iron; others that it was the best steel they ever saw. Those who understand the manufacture of steel castings will be able to judge best. With the best material it is possible to make the worst product, if not manipulated properly. It is very encouraging, however, to note how seldom raw material is spoiled in the handling even by men of very little experience. Failures have happened no oftener in this process than in any other, even in those in which operators have had much more experience.

The steel molder has been accustomed to see the steel castings come out of the sand pretty rough. This is due to the physical or chemical action of the metal upon the face of the mold and also from the fact that molds are often prepared with a rough surface. If hot steel is poured into a smooth mold, gated properly, and made with sand of the right quality, there is no reason why the castings should not come out nearly as smooth as a gray iron casting.

The steel should not be poured too hot because the shrinkage will be necessarily greater and the chances are that the casting may be spoiled through shrink holes or pulling apart. It is an easy matter to get steel cold enough, so that whenever a casting is spoiled on account of being poured too hot, it is the fault of the men who cast. This is sometimes the case in plants when the men have no experience with Bessemer steel, and it is probably the reason why the open hearth men get the poorest results with this steel at the beginning.

Usually the open hearth men pour the steel, when using that process, into the mold whether hot or cold, for they cannot ascertain its state before pouring on account of using bottom pouring ladles. Moreover the amount of metal to be distributed in one heat is so great that the pouring must proceed without delay in order to get the steel out of the ladles before it chills.

Tropenas steel foundries, on account of the amount of steel handled at one time, and the way in which it is manipulated, are comparable to iron foundries. We see the surface of the steel before pouring and can tell whether it is fit or not to go into a mold. With a good foundry equipment and men handled properly the best castings can be made.

In conclusion, reference is again made to the special suitability of this steel for electrical purposes. There is no process known which makes dynamo and general electric castings so satisfactorily. It is very easy to make them with the closest regularity. The chemical analysis of this steel is approximately: Silicon, 0.04 per cent; Manganese, Trace; Carbon, 0.09. Sulphur and Phosphorus according to the quality of the raw material.

The total iron in this material is from 99.70 per cent to 99.80 per cent, that is to say it is practically wrought iron free from slag. To produce this material in a manner enabling it to be handled and poured into the molds requires an exceedingly high temperature. Large quantities of magnet steel castings are now made in this country, and it is hoped that electrical engineers will soon appreciate the advantages offered by this method.

This process recommends itself especially to cast and malleable iron founders, who may wish to substitute steel for these metals as it only requires an additional installation of a converter and its accessories, at a cost not excessive. That the tendency of the trade is to substitute steel for cast iron in some measure will not be denied as with a slight additional cost a metal can be made which will offer a superior strength not obtainable by cast or malleable iron. Moreover steel being so much stronger castings can be made much lighter and cost but little more owing to the reduced weight. From the fact that a sound steel is obtained the machinist is saved such labor as is expended in machining castings which oftentimes do not show their blow holes and defects until after much money has been lost.

This process, unlike the open hearth, permits intermittent operations as the heating of the converter is cheaply accomplished. According to the demands of the market the foundryman can work his converter continuously, or he may discontinue its use until he has again gathered a sufficient number of molds to warrant him to fire again, exactly in the same conditions as melting with a cupola. In casting, owing to the great fluidity of the metal, but very small heads or risers are required.

Chimmie Powers' Answers to Correspondents.

S. M. O.: Whenever you ask de foreman fer yer time an' he don't give it to you, take it away from him.

Lady Reader: A dog shop is an annex to de main foundry; de word dog as applied is misleading, I know, but you're not de first one which was mistaken in dat respect.

Oliver G.: Yes, der's something doing all de time in a steel foundry, an' you'd find it out, too, if you started to work in one. You can't go away back an' sit down, like you kin in an iron foundry.

I. C.: You lose; de guy which you took to be de foreman wus only de day watchman in dat shop; it don't cut no ice if he did have van dyke whiskers.

Newton K.: I kin tell frum de tone of your letter dat you's a dandy molder, an' I'll bet if you had a can of beer an' a piece of chalk you could cast a gasoline stove complete whit de oil tank attached.

Joplin, Mo., Oct. 20, '01.—Mr. Powers: In attempting to close a cope on a two-foot gear wheel, my cope dropped out. I patched it up, and attempted to close it again, but with the same result. This occurred three times, and the foreman finally made me shake it out. Could such an occurrence be overcome, and what could be done? NEW BEGINNER.

I dunno, less you lay de cope on its back on a bed uv sand (when she's as far gone as de one you speak uv) an try to close de drag on de cope, but in a case like dat always get some one to look under.

Kansas C.: (1.) Der are no set rules which a molder is bound to observe concerning his dress while at work. A pair of suspenders will do from de waist up. (2.) "Growler" Kennedy an' "Cigarette" Jack don't travel togather any more. (3.) Put yer "dough" in bank, den you won't get touched

Western Molder: Yes, dat wus de finest shop in de land, for de sick, de lame, an' de lazy.

Davenport, Iowa, Oct. 20, '01.—Mr. Powers, Dear Sir: I have noticed in my time that all of the molders employed in foundries are young, or middle-aged men. What becomes of all the old molders? Y. V. T.,

R. U. YOUNG.

Some of dem retires to a quiet suburban home and serves as day watchman of der own estate, others are used by de trusts untill dey gets full uv rhumetism an whiskers, den de'r laid off, den wen de end comes dey fill up low places whit dem.

Eddie: (1) You win; de color of de sand which a green sand molder uses is black. (2) Yes, a mold will get blue molded some times if it's let stand long enough; dat's a cinch. (3) It is bad form fur a molder to try to work whit a snute full; if he does, de gaffer ought to chase him P. D. Q.

S. E. ATTLE.

The Philadelphia Foundrymen's Association.

The Philadelphia Foundrymen's Association held its annual meeting at the Manufacturers' Club, in Philadelphia, Wednesday evening, Nov. 6th. The president, Thos. I. Rankin, presided. Secretary Howard Evans announced that the question of incorporating the association would be taken up at the December meeting. The officers nominated at the previous meeting were elected in a body and comprise:

President, Thomas I. Rankin, Abram Cox Stove Co., Philadelphia.

Vice-President, James S. Stirling, Harlan & Hollingsworth Co., Wilmington, Del.

Treasurer, Josiah Thompson, J. Thompson & Co., Philadelphia.

Secretary, Howard Evans, J. W. Paxson Co., Philadelphia.

Executive Committee, Antonio C. Pessano, chairman; George V. Cresson Co., Philadelphia; Stanley G. Flagg, Jr., Stanley G. Flagg & Co., Philadelphia; E. E. Brown, E. E. Brown & Co., Philadelphia; John Glover, Glover Bros., Philadelphia; William Hanson, Penna. Iron Works Co., Philadelphia, with the president and secretary, ex-officio.

H. M. Baldwin, representing the Bryan Vacuum Molding Machine Co., gave a short description of that machine and its possibilities. This was illustrated in our last issue.

Wm. D. Allen, of Huntsville, Ala., presented a paper entitled, "Controlling the Contraction of Metals While Casting." As far as we are able to understand the points brought out in this paper, the author's method, which he describes, is intended to be used in casting such metals as aluminum, and others having a relatively low melting point and a high shrinkage. Principally it consists in heating the mold before the metal is poured into it and afterwards letting the whole cool together. This, we believe, is now being carried out in making aluminum castings of such designs as do not permit of ready contraction. Mr. Allen's ideas may be all right in some particulars, but some of the drawings and illustrations of his furnace, to say the least, do not appear practical.

It was moved to appoint a committee on behalf of the association to attend the National

Reciprocity Convention which met in Washington, November 19th.

After the meeting, an enjoyable social session was held, at which several of those present made speeches touching upon the questions of today.

Brass Founding—The Use of Scrap Metals in Alloying.

Old brass is generally separated by the dealers into two kinds, viz.: red brass scrap and yellow brass scrap, and these are again sorted into heavy red and light red, heavy yellow and light yellow brass. The heavy scrap commands a better price than the light, as it takes up less room, and is easier to handle when melting. A load of heavy red brass scrap will consist of old bearing brasses, valves, oil cups, car brasses, pieces of bells and a miscellaneous assortment of old machinery scrap that it would be useless to attempt to describe. Light red will be composed largelv of material that has been rolled. As yellow brass is not so extensively used for machinery as bronze, heavy yellow scrap will be more in the line of old faucets, pieces of tubing, old gas fixtures and trimmings and any yellow brass work that was originally cast. Rolled material, sheet brass, such as clippings and stampings, etc., are classified as light yellow. The above mentioned old metals are not the only ones used in the foundry. In addition we have scrap copper, in the shape of old commutator bars, wire, clippings and copper bottoms; yellow and red brass borings and turnings and white metal scrap, which comes as old cruet-stands, syphon tops, teapots, urns, mugs and silver-plated Britannia ware of all descriptions. This material is known as pewter, and is used largely in place of tin. There are foundries that never use any other materials than scrap in their castings: others use part scrap and part new metal: and a few, new metal wholly.

For the purposes of this article we will imagine we have just received a load of heavy red brass scrap, and that, while we have to use it in order to cheapen our product, our castings have to be turned out of uniform color and hardness. Now, if we use our scrap promiscuously, even if we do put the same quantity in each pot, we cannot be certain that any two heats will be alike, because our scrap may differ widely in composition. In such a case, therefore, it is necessary to first sort the scrap. The large pieces will at once catch our eye, and of these such things as driving brasses, rod brasses, bushings, all bearing brasses except car brasses, we put in a bin by themselves, as they are of hard metal. Car brasses are excepted from this list, because their composition is so uncertain, and so often dishonest. They are liable to contain large quantities of iron, and in any case are justly regarded with suspicion. If the load of brass is composed largely of this material return it, as it is not what you want for general jobbing; let the car-brass man use up his own scrap. Then we may find numbers of valves, oil cups and clean pieces of machinery scrap; these we pick out and put in their bin. This is generally soft brass or steam metal. With regard to the machinery scrap, that we cannot classify; the mere fact of its being clean or otherwise is of course no index to the quality of the metal. It is obviously impossible to give instructions on paper that will enable anyone to sort out and classify this material, as well as one who has had practical experience. In general, all brass that is used on the moving parts of machines will be hard, and tnat used to resist the pressure of water or steam will be soft and tough. The sorter will probably have seen lots of castings made, and will have an idea of the kind of metal used in them; so when he comes across anything which he recognizes, he will be able to classify it, according to the kind of metal he knows was used in the ones he saw, whether it was hard or soft. When all castings whose quality we can judge of have been picked out, we will have left a mass of small material that, as before remarked, it is impossible to classify. This we can shovel into a bin by itself.

Now that we have got our scrap sorted, we will have some idea of what we are doing when using it in making alloys. According to the character of the work, and our knowledge of the quality of metal required, we can proportion the scrap to the new metal, using one-third, one-half, two-thirds, or all scrap, as the case may call for. A No. 40 crucible will hold 120 pounds of metal; we want to take out a heat of good, ordinary soft bronze, using about two-thirds scrap. As each ingot of casting copper will average 18 pounds in weight, we take two of them, or 36 pounds of copper. The mixture for this may be 2¼ pounds each of tin, zinc and lead, equal to 42¾ pounds of new metal, and added to this 75 pounds of scrap, will make 117¾ pounds, about as much as it is desirable to put in the crucible. When weighing the scrap, we take 50 pounds of soft metal (the valves, etc.) and

25 pounds of the miscellaneous scrap; or, if we have to use some of those car brasses, we can make our mixture 50 pounds valves, 15 pounds small scrap, 10 pounds car brasses, added to the new metal, and by keeping these proportions constant, the color and quality of the alloy will not materially vary in different heats. We can also use yellow brass in place of the zinc, if thought advisable. The average yellow brass is composed of 2 parts of copper to 1 of zinc. Instead of the 2¼ pounds of zinc, therefore, we may use 6¾ pounds of yellow brass. In using this brass, though, we have added 3½ pounds more copper, so that instead of 6¾ pounds of brass we should use about 7¾ pounds, to make things right, and increase the tin and lead a scant ¼ pound. In order to get these into the crucible, we must cut the scrap content to 70 pounds. This mixture will therefore read: Copper, 36 pounds; tin, 2½ pounds; lead, 2½ pounds; yellow brass, 7¾ pounds; scrap, 70 pounds.

While this is a good ordinary mixture, it is given more by way of illustration than as a formula. It can be cheapened considerably by using pewter instead of tin, and yet further by reducing the tin or pewter one-half and doubling the lead. Even at this latter stage it is a good metal to use in all small castings that have to be rapidly machined, as it works well under the tool.

Perhaps a few remarks about pewter would not be out of place at this stage. Although this scrap is called "pewter," it will, if it is of good quality, mostly consist of Britannia ware, the silver-plated articles so familiar in our homes. Their composition is mostly tin, with antimony and a little copper. The scrap on arrival should be carefully picked over, and all foreign metals weighed back. The cruet-stands always have an iron screw in the *stem*, and fruit-dish handles are generally brass. Get a file and try the suspected articles. If the file cuts easily, the metal is Britannia or pewter; if not, try it with the magnet, and if not iron, it is either zinc or German silver; or if the article is small, it may be real silver. If it is zinc or German silver, you don't want it; if zinc, because you cannot afford to buy it at the price of pewter, and unless you are using German silver in your business, it is worth no more than yellow brass to you, in the quantities in which it is found in pewter. If it is real silver, it will be stamped sterling somewhere, will not turn green where touched with nitric acid, and is worth 48 cents an ounce. Having sorted the pewter, the best thing is to run it down into small ingots, and also to make some little cakes, for make-weights, by pouring it on the floor. By thus melting it down we get our tin uniform, as the real pewter contains lead; we need make no allowance for this in our mixture, however.

The hard scrap, that we first picked out, we have taken no notice of so far. If we make a considerable quantity of hard bronze castings we can use this scrap in the manner just suggested for soft metal, using of course the regular hard formula for the new metal added, instead of the one we have been considering. Where there is no call for hard bronze, this kind of scrap may be used as "mixing" in the place of tin or pewter, the same as yellow brass is used in place of zinc. For driving brasses (these are the large semicircular brasses used on the axles of locomotive driving wheels) we may figure that 7 pounds of metal carry 1 pound of tin; thus we add 6 pounds of extra copper to every pound of tin. The zinc and lead content we do not need to notice. In rod brasses 8 pounds of metal average 1 pound of tin, while heavy bells carry a pound of tin in every 5 pounds of metal. A little figuring will show how to use these metals to advantage, along the lines laid down. As bells, however, seldom contain any lead, and only just enough zinc to provide against porosity, we must add sufficient of these metals to alloy the additional copper. Where hard castings are occasionally called for, and the customer expects to get them at the same figure as his softer castings (as is often the case), we can save this scrap for use on such occasions. Work in phosphor bronze will also occasionally come in, and be expected at a low figure; in such cases our assorted hard scrap is a money-saver. Melt it, and to every 100 pounds add 2½ ounces of phosphorus, just before pouring.

The chief drawback to the use of scrap is found in the fact that every piece is more or less oxidized; and when the metal is melted it contains considerably more oxide of copper than is good for it. Phosphorus is a good deoxidizer. Manganese may be used, so may silicon and aluminum; but the latter is not recommended here, as it is a bigger enemy to the brass founder than iron. A piece of phosphorus, ½ inch in length, added to every pot of metal improves it considerably. Fluxes also are used to eliminate the oxide and other impurities. A refining flux is composed of equal parts crude tartar and nitre burned together. Stir into the metal a couple of pieces

of this of the size of a walnut before pouring.

Another flux is composed of 1 part crude carbonate soda, 2 parts anthracite coal (pulverized) and 1 part salt, mixed; a couple of handfuls are thrown in while the metal is melting. The following mixture for improving alloys was the subject of a patent: Iron peroxide, 33 parts; manganese peroxide, 1 part; magnesium carbonate, ½ part; alumina, 18 parts; silica, 3½ parts; sodium bi-borate, 4 parts. Mix and stir well into the metal.—[C. Vickers in American Machinist.

Notes from Various Sources.

In line with its policy of doing the greatest good to the greatest number, the S. Obermayer Co. have established a large branch depot and offices at Thirty-fifth and Charlotte streets, Pittsburg, where, with ample warehouse facilities, they will carry a complete stock of foundry supplies and equipment, and be in a position to give the foundrymen of Pittsburg and vicinity that prompt service for which the S. Obermayer Co. is noted. Mr. William Fitzpatrick, who has for several years represented this company in Eastern territory, will be manager of the Pittsburg branch.

The manufacturing interests of Port Huron, Mich., are large consumers of malleable iron castings and at times have suffered annoying and injurious delays in obtaining their requirements in this line. To overcome this the Port Huron Malleable Co. has been organized and contracts have been let for the construction of a complete malleable iron foundry, which will be so arranged as to readily permit of extension when necessary. The new concern has assurances of a large business outside of the local demand, and it is predicted that the demand for its product will tax the capacity of the plant from its inception.

Richard Corcoran will fill the position of superintendent and general manager with the Port Huron Malleable Co. Mr. Corcoran has had a large experience in the malleable trade, his first connection beginning about thirty-five years ago with the Westmoreland Malleable Iron Co., of Westmoreland, N. Y. He remained with this concern about fifteen years and severed his connection with it to take charge of the foundry of the Michigan Malleable Iron Co., of Detroit, Mich. He continued in the capacity of superintendent for the Michigan company about eight years, when he was induced to take a similar position with the Albion Malleable Iron Co., of Albion, Mich. This position he has held for a period of twelve years, and leaves it with the good will and respect of his former employers to assume the general management of the business of the Port Huron Malleable Co.

The J. D. Smith Foundry Supply Co., proprietors of the Cleveland Facing Mills, are erecting a large addition to their Cleveland plant. They have also leased the five-story building at 36, 38 and 40 South Water street in that city with the object of increasing their warehouse capacity for foundry equipment and supplies.

W. I. Reardon has resigned his position as foreman of the Kennedy Valve Co.'s foundry, Coxsackie, N. Y., to accept the general foremanship of the brass foundry operated by the Westinghouse & Electric Mfg. Co. at East Pittsburg, Pa.

The Chicago Pneumatic Tool Co. are mailing their No. 15 catalogue to the trade. This, like other printed matter sent out by this company, is a neat and complete work and shows their various tools in operation from photographs taken of noted buildings and structural work.

The Standard Pneumatic Tool Co. have removed their general offices to Aurora, Ill., where all correspondence should be addressed. This places them in immediate communication with their new works, which has been provided with increased facilities.

The Cleveland Pneumatic Tool Co., Cleveland, O., have issued their catalogue "D," which describes the pneumatic appliances they manufacture. It contains illustrations of the Cleveland tools taken while work is in progress.

There is one man in the foundry supply business who never does his advertising by halves. This is S. R. Church, of San Francisco, Calif., who, although he can only reach a limited trade from that point, has gotten up some of the neatest foundry literature printed. We are reminded of this by a finely illustrated circular sent out by Mr. Church in the interest of the Muirkirk Charcoal Pig Iron made by Charles E. Coffin, of the Muirkirk (Md.) Furnace. The output of this furnace is limited and its product is a special iron, which is claimed to be the strongest pig iron made in the United States.